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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

ANNUAL REPORT

OF

ALASKA AGRICULTURAL
EXPERIMENT STATIONS

FOR

1907.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

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**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA, KENAI,
COPPER CENTER, RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment
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LETTER OF TRANSMITTAL.

SITKA, ALASKA, *January 29, 1908.*

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations for the year 1907.

Respectfully,

C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

Dr. A. C. TRUE,

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Publication recommended.

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Publication authorized.

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ANNUAL REPORT OF ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1907.

SUMMARY OF WORK.

By C. C. GEORGESON, *Special Agent in Charge.*

The work of the year has been carried on in accordance with the plans outlined in former reports. Details will be given under the work of the respective stations. In the line of new work the two projects which were planned for this year, namely, the establishment of a live-stock breeding station on Kodiak Island and the opening of a station at Fairbanks, have been accomplished. Both stations are important and will, it is hoped, in time show results of much value to Alaska.

The season was unfavorable for crops along the coast. The summer was cold and rainy, and in consequence vegetables of all kinds were only moderately successful. Nearly all correspondents in the coast region report that their success fell short of expectations. In Alaska the husbandman is dependent upon the sun to a greater extent than in any other region of the United States. When the summer is bright and full of sunshine he succeeds. When it is cloudy and rainy it means that the earth does not get its normal amount of warmth and he fails. In the interior the climatic conditions during the past season may be said to represent an average for that region. Grain crops matured both at the Rampart Station and at the Copper Center Station.

CHANGES IN STAFF.

Mr. J. W. Neal, who had been in charge of the Copper Center Experiment Station from its opening, in July, 1902, resigned January 31, 1907. The long stay in the interior with his family made a change imperative. His place was taken by Mr. Charles W. H. Heideman, who has had a wide experience in several lines of agricultural work, especially in horticulture. He began work the 1st of March, 1907. Mr. Charles W. Heideman, jr., was employed as an assistant at the Copper Valley Station. His services began April 1, 1907.

Mr. P. H. Ross, who had been in charge of the Kenai Experiment Station for three years, resigned May 1, 1907. His place was taken temporarily by Mr. Jas. W. Gray, of Missouri. Mr. Gray had been connected with the Kenai Station during 1906 and was familiar with the work.

Mr. M. D. Snodgrass, B. S., a graduate of the Kansas State Agricultural College, has been employed to take charge of the Kodiak Live Stock and Breeding Station. His services began June 8, 1907.

Mr. J. W. Gasser, B. S., also a graduate of the Kansas State Agricultural College, has been temporarily employed to take charge of the Rampart Experiment Station during the absence of the superintendent, Mr. F. E. Rader, who is absent on a furlough, after several years' continuous service in Alaska.

ESTABLISHMENT OF A LIVE-STOCK BREEDING STATION AT KODIAK.

There is an urgent need for this station. It is conceded that a large section of Alaska is eminently fitted for cattle raising, particularly the western half of the coast region, where there is an abundance of grass and the winter climate is comparatively mild.

That cattle of the right type can also be kept in the interior can not be doubted. A few cows are kept at several places, and at Holy Cross Mission, on the lower Yukon, cattle have been kept for several years, the herd now numbering thirteen head, all of which are doing well.

Owing chiefly to the great expense, few settlers can afford to import cattle, and those that are imported are not selected for hardiness and are not particularly well suited to the climate. They have been brought for the most part from Washington, Oregon, and California, where Jersey blood prevails.

One reason for the establishment of this live-stock breeding station is to introduce hardy races of cattle and sheep. By disposing of their progeny at reasonable rates for breeding purposes, the station can aid in stocking Alaska with live stock suited to the climate.

The Galloway breed was chosen as the one which, all points considered, gave the best promise of success. This breed originated in Scotland upwards of two hundred years ago, and they have been bred to rustle for themselves. They have not usually been housed in winter, but took the weather as it came. Under such conditions nature gradually provided them with a heavy coat of hair, and this peculiarity having been inbred for many generations, is now a fixed character. It has been retained by those which are bred in the United States under much milder conditions, in spite of the fact that they are housed in order that they may produce much beef. In this respect they compare favorably with the other large beef breeds. It must be

noted, however, that some of the Galloway herds in the States are losing the distinctive thick coat of hair under this treatment. It is almost certain that in Alaska the tendency to grow a heavy coat will receive a new impetus, and in the course of a few generations Alaska Galloway robes will be as serviceable as buffalo robes or bearskins or as the hide of the musk ox.

The cow needed in Alaska is a dual purpose cow, one that will produce milk as well as beef, and as a breed the Galloway is distinctively a beef animal.

The first problem to solve, then, is the development of the milking quality without losing the other valuable characters. This will be attempted by selection and breeding. To this end the animals which have been purchased as foundation stock have been selected with a view to the milking qualities either in the individual or in the family when the individual had not arrived at an age to show it in herself. A few fairly good milkers have been secured. One cow in particular could not be dried up, and the breeder sold her because her milking propensity told against her in the show ring. This cow gave milk for 11 months, being sucked by her calf until she dropped another. In the future breeding of the station herd the milking qualities should be emphasized and encouraged, and, other things being equal, the heifers which prove to be the better milkers should be retained for breeding, while all inferior milkers should be used for beef.

The first purchase of Galloways for these experiments was made in the spring of 1906 and consisted of 2 bulls and 9 females. One bull and 6 females were placed at the Kenai Experiment Station and 1 bull and 3 females, all of them two-year-olds, were sent to Wood Island near Kodiak (see report for 1906, p. 21). These have all done well. The purchase of foundation animals was completed in the spring of 1907, when 19 head were purchased, 1 bull and 18 females. The animals were purchased from three well-known herds in Illinois and Nebraska. Of the females 7 were yearlings past, 6 were two-year-olds past, and 5 were cows, among them imported Lady Douglass, No. 23478, and Fidelia, No. 24210, both of which have won fame as show cows. The cow Fidelia is a particularly fine Galloway. Her tendency as a milker is the only drawback to her as a show cow, according to the standard of Galloway breeders. Her son, a bull calf, Alexander, No. 28844, was also purchased. He is a remarkably fine individual and is sired by the famous show bull Pat Ryan of Red Cloud, No. 20038. Pat Ryan is himself out of a dam which is a good milker and he has sired four of the heifers bought in one lot. Seventeen calves have been dropped by the females purchased, and the station owns at this writing in all 50 head of pure-bred Galloways—27 females, 3 bulls, and 20 calves (3 cows having calves when bought). The imported bull, Henry of Lochside, No. 22525 (8809), heads the

herd. He was purchased in Missouri in the spring of 1906 as a three-year-old, and has been at the Kenai Station since he was brought to Alaska.

The accompanying illustration will give some idea of the appearance of the herd at their new home on Kodiak Island (Pl. I, fig. 1).

The writer selected all of these cattle, but in the 1907 purchase he acknowledges having received valuable suggestions from Mr. Charles Gray, secretary of the Galloway Breeders' Association, who very kindly volunteered to accompany the special agent on his visits to the various breeders. Being an expert judge and familiar with the history of the leading families of the breed, his suggestions were much appreciated.

The Alaska stations are also indebted to the Chief of the Bureau of Animal Industry, Dr. A. D. Melvin, who kindly dispatched a veterinarian, Dr. W. F. Lavery, to inspect the selected animals and to test them for tuberculosis before they were purchased. The great value of these services is hereby acknowledged.

The second lot of cattle were purchased in the latter part of February and the beginning of March, 1907. They were assembled at the stock yards in Kansas City, whence they were shipped to Seattle in ordinary cars. At Seattle they had to wait two weeks for transportation to the westward. Accommodation was finally secured on a steamer, which landed them in Kodiak on April 27. In spite of some rough weather and the long confinement they stood the voyage remarkably well and not a single animal suffered from accident of any kind. They also held their own in flesh and were landed in excellent health and spirits. For a couple of weeks they were fed alfalfa hay, but the grass soon began to start and they were turned to pasture. Like the importations sent to Kenai Experiment Station in the spring of 1906, they lived wholly on the native pasture and soon became rolling fat.

The breeding station is located on the reservation made by Executive order dated March 28, 1898, and consists of 160 acres adjoining the town of Kodiak. This tract is too small for the purpose, and as the whole country is unclaimed hill land belonging to the Government, some adjoining hillsides and woody dells to the extent of about 300 acres have been temporarily added.

For lack of means no station buildings have been erected. A log house located in the outskirts of the town has been rented as a stable for young calves and a storehouse for feed. A near-by house has also been rented for the superintendent.

The immediate charge of the station has been intrusted to Mr. M. D. Snodgrass, B. S., for some time past an assistant in the experiment station of Kansas. He arrived in Kodiak in July and took hold of the work energetically. He was also appointed inspector of Kenai



FIG. 1.—GALLOWAY CATTLE AT KODIAK STATION.



FIG. 2.—LOG BARN AND CATTLE PENS AT KODIAK STATION.

Station, as he could visit Kenai in much less time and at less expense than the writer could do it from Sitka. He has made two visits to Kenai Station since his arrival. At the direction of the writer he transferred 11 head of Galloway cattle (8 grown animals and 3 calves) from Kenai to Kodiak at his last visit in October. This became necessary because there was a shortage of feed at Kenai and it is impossible to send feed to that station during the winter months. The shortage was due to the natural increase in the herd without a corresponding increase in the area devoted to feed growing. The transfer is in conformance with the plan outlined in last year's report, and will ultimately result in the closing of the Kenai Station and transfer of all the cattle breeding and dairy work to Kodiak.

RECOMMENDATIONS FOR WORK AT KODIAK STATION.

The land in the immediate vicinity of the town of Kodiak, including the reservation of 160 acres, is more or less covered with spruce forest, which yields but little pasture. When the herd increases to a number deemed adequate for the experiments there will not be sufficient pasture in that region. It is believed that a reservation should be made in the grassy valley at Calsinsky Bay of about 12 square miles in extent. Calsinsky Bay is located 15 miles south of Kodiak. It can be reached either by water or by land, though the former is easier, because the overland route crosses a precipitous ridge. The tract of land referred to is covered by a luxuriant growth of grass which will furnish an abundance of feed for several hundred head of cattle the year around. No homesteaders have located there and the region is entirely uninhabited, so there will be no encroachment upon the rights of settlers.

A temporary selection of pasture land at Calsinsky Bay has been made for the purpose of these experiments, and as soon as the tract can be surveyed a permanent reservation will be recommended. It is further recommended that the entire equipment, implements, dairy apparatus, etc., now at Kenai Station be transferred to Kodiak Station in the spring, and that the dairy work which was so successfully begun at Kenai be continued at Kodiak, using the best milkers among the pure-bred Galloways for dairy cows. This change is recommended in the interests of economy and efficiency. Live-stock experiments were not undertaken until Congress made a specific appropriation for the purpose two years ago, and since these experiments could best be carried out at Kodiak it was decided to locate the live-stock breeding station there. The dairy work at Kenai can profitably be combined with the work at Kodiak, and the expense of maintaining the Kenai Station can be saved. Another reason for closing the Kenai Station is that Kenai Peninsula has not developed

as was expected when the station was located there, and that therefore the transportation facilities, more especially the facilities for the shipment of live stock to and from Kenai, remain very inadequate. In fact, the station is entirely inaccessible from October to April of each year. A suitable dairy building at Kodiak, together with the necessary barn and shed room and a cottage for the superintendent of the station, are required.

With the erection of a cottage for a foreman at Calsinsky Bay and also the building of a barn and hay sheds at that place, the plan will then be to breed and feed the main body of the herd at Calsinsky Bay. The best milkers would be separated for the maintenance of a dairy at Kodiak.

As the herd increases the surplus stock could be sold to settlers in Alaska at reasonable prices, not to exceed those at which cattle can be brought into Alaska from the Puget Sound country. If these pure-bred Galloways are sold at moderate prices, so that the people can afford to buy them, the station will in a few years be self-sustaining. This policy will at the same time materially aid both in populating Alaska with a hardy breed of cattle suited to the climate and in helping the settlers to develop a live-stock industry.

It is also recommended that a small flock of sheep of the hardy breed which has been raised in Iceland for centuries be purchased and imported for this experiment station. The Black-faced Scotch sheep would probably answer the purpose well, and that breed should be introduced also, but there probably is no sheep which will do as well in Alaska as the Icelandic sheep. It is a large mutton sheep that also yields heavy clips of coarse wool.

THE ESTABLISHMENT OF FAIRBANKS STATION.

The Special Agent visited Fairbanks in July to begin work on the experiment station, for which a tract of land of approximately 1,400 acres was reserved by Executive order dated March 22, 1906. Ten acres of land were cleared and made ready for spring work. The station equipment, consisting of a full complement of the necessary implements and also the necessary seed grain, was purchased, shipped to Fairbanks, and safely landed there. These articles were received and placed in storage. Through the courtesy of the U. S. Geological Survey four horses were secured for the use of this station, selected from the pack horses used by the Geological Survey party which operated in the Fairbanks region last summer. At the close of the season their horses were to be condemned and sold, but the best four were transferred to the Department of Agriculture for use at the Fairbanks Experiment Station. Arrangements were made with the stage company which operates between Fairbanks and Valdez during

the winter to work the horses for their feed, the stage company giving proper bonds for their return in good condition or to replace them with equally good horses in case of loss or injury.

While at Fairbanks bids were obtained for lumber for the necessary buildings to be erected next season. A small frame building was purchased and moved to the station, where it will afford shelter to the superintendent immediately upon his arrival and until other buildings can be erected, after which it can be used for other purposes.

As superintendent for the station, Mr. J. W. Neal, who had charge of the Copper Center Experiment Station for four years, and whose work at that station reflected conspicuous credit both on himself and on the Government, has been engaged. Mr. Neal severed his connection with the station last winter and left Alaska but, being interested in the work, he has consented to undertake the pioneer work connected with the development of the Fairbanks Station. It is planned that he shall arrive at Fairbanks by the middle of March and begin work. Unfortunately, the means at our disposal for work at this station are so limited that he will not be able to employ as much labor as is needed during the remainder of the present fiscal year.

PLANS FOR WORK AT FAIRBANKS STATION.

After careful investigation of conditions in the Tanana Valley the Special Agent ventures the opinion that, with proper management, both grain growing and stock raising can be carried on successfully in that valley. It is therefore planned to practice mixed farming at the Fairbanks Station with a view to demonstrate what can be done in these lines. It is proposed that as soon as the pioneer work of clearing the ground and erecting the necessary buildings has been done the station shall, if possible, become self-supporting and thereby serve as an object lesson of the possibilities of farming in Alaska.

Special attention will be given to crops for which there is a market in the immediate neighborhood. As soon as a sufficient area has been cleared for the production of feed for a small herd of cattle, some of our milking Galloways will be transferred from the Kodiak Station to Fairbanks, with a view to test them in that climate, and if it shall be found practicable, a dairy will be operated in connection with the station. This can not be done for at least two years, unless Congress shall see fit to hasten this step by an increase in the appropriation for the clearing of land. When the cattle are introduced the breeding experiments now outlined for Kodiak Station should also be conducted here.

It is desired to introduce chicken raising at this station on a fairly large scale at an early date. This means the building of suitable houses which must be heated in winter in order to keep the chickens

from freezing. If the experiment proves successful the sales of fresh eggs, which now range from \$2 to \$5 per dozen, should materially increase receipts, and thus aid in further development work. While the practical side will thus be emphasized, the experimental side of the work will also receive due consideration. The grain experiments which have been inaugurated at Rampart and at the Copper Center Experiment Station will also be undertaken at Fairbanks Station. Particular attention will be given to the development of early maturing varieties of wheat, barley, oats, and rye and for the growing of seed grain for Alaska consumption. There is on the station a low lying tract of land surrounding a lake of about 25 acres in extent. This tract will afford excellent soil for the testing of grasses and forage plants of all kinds, and experiments along this line will be undertaken as soon as funds are available to hire the labor to prepare the ground.

The immediate needs of the station are a dwelling for the superintendent and a barn and outhouses for the shelter of the animals, implements, and crops. Seventy-five or one hundred acres should be cleared as soon as possible, and eventually the cleared area should be extended to several hundred acres. In order to make a practical test whether or not mixed farming can be made a success, operations should be carried out on a fairly large scale.

PROGRESS IN THE FAIRBANKS REGION.

There has been a steady progress in the growth of the farming industry in and about Fairbanks during the last two years. There are hundreds of private gardens which as a rule are in a flourishing condition, and there are a number of market gardeners and ranchers who grow produce to meet the demands of the town and the miners on the creeks. These market gardeners are all doing well. They raise potatoes, cabbage, cauliflower, lettuce, radishes, turnips, carrots, peas, and everything else for which there is a market. Home-grown potatoes retailed at Fairbanks last August for 20 cents per pound and potatoes shipped in from the Puget Sound country brought the same price. Potatoes yield abundantly in the rich sandy soil and the quality is first class. The same is true of cauliflower and early cabbage, both of which are produced to perfection. There is no longer the slightest question as to whether or not vegetables can be raised in the Tanana Valley. With ordinary care they are an assured and conspicuous success. Magnificent celery is grown there and was on the market in August. It sold at 50 cents a plant. Celery is best grown in a specially prepared bed on which the soil has been mixed to a depth of $1\frac{1}{2}$ feet with about 25 per cent of horse manure. The plants are started early in boxes in the greenhouse, and when ready

to set out are planted 4 or 5 inches apart each way. As the plants grow the bed is inclosed with boards 2 feet high. The dense growth of top almost entirely excludes the light from the stems so they are practically self-blanching, and where this is not the case the stems are blanched by filling the space between the plants with soil. The possibility of producing fine large plants without artificial heat by the middle of August speaks well for the climate. The rainfall is usually sufficient for the growth of garden vegetables. There is sometimes a period of drought in the early part of the summer when liberal watering must be resorted to. Irrigation by gravitation is not practicable except in a very few instances.

Mr. W. Weurich, of Chena, who has a large and successful market garden at that town, has constructed a water wheel by means of which he elevates water from the Tanana River for irrigating his market garden of some 7 or 8 acres. Mr. Weurich has kindly given a brief description of his method in a letter which will be found under "Reports from Seed Distribution" (p. 79). Some eight or ten of the professional market gardeners have built greenhouses for the raising of early produce. In the construction of these houses the main point has been to get the largest possible area under glass at the least possible expense. They are in nearly all cases heated by large wood stoves, from which a flue is conducted to the chimney built at one end. It requires much work and care to maintain a uniform temperature with a heating apparatus of this nature, but the Fairbanks gardeners are proving that it can be done successfully. Early crops of radishes and lettuce are raised in these houses, but the main crops are tomatoes and cucumbers, and by July the wire trellises under the glass are loaded with tomatoes, which find a ready market at \$1 per pound in the early part of the season, or with cucumbers, which in the early part of the season sell as high as 50 cents apiece, or \$5 per dozen. Cabbage and cauliflower bring the producer 25 cents a pound. One of the largest market gardeners in that region is Mr. J. P. Rickert. He has upwards of 20 acres in vegetables and several greenhouses. He imported some strawberry plants in the summer of 1906. They wintered successfully, and the past summer he had a monopoly of the strawberry market.

The high prices which have so far prevailed for garden produce have induced a large number of people to go into the business, and in the future it is likely that competition will be felt. Nor is it all profit. Living is costly, necessary supplies of all sorts are very high, and labor costs \$5 a day with board or \$7.50 a day without board.

The flower gardens of Fairbanks deserve to be mentioned (Pl. II, fig. 1). Several private homes were surrounded by most luxuriant beds of flowers. Like the vegetables, flowers seem to attain a greater size and brilliance there than in more southern climes. The sweet

peas, nasturtiums, poppies, pansies, stocks, aster, and dozens of other sorts grow to perfection. Giant specimens of sunflowers with flowers as large as dinner plates were blooming with the same luxuriance one sees them display in the cornfields of Kansas, only these were the improved sorts.

There are as yet but few cows in the Fairbanks district and milk sells at 50 cents a quart. There would seem to be a good opening for a few enterprising dairymen. Horses are numerous. They are used in the mines, on the stages and drays, for freighting and pack horses, and in the winter for lumbering and on the sled stages. Comparatively few are used exclusively for farm labor. There is a good market for horse feed, and a few ranchers have seen the opportunity and are growing oat hay on rather an extensive scale. Others have cleared tracts of level land and use the native grasses for hay. There is a diversity of opinion as to the value of the native grass for hay. Some maintain that it is good for feed and others hold that it is almost worthless. The trouble with those who hold the latter view is probably due to the fact that they do not cut the grass when it is at its best. They wait until along in late summer when the grass is going to seed, and instead of a sweet succulent hay, which it would have made if cut earlier, it is merely a bunch of dry stems, bulky enough, but lacking nutrition. This is especially the case with the most prominent grass of the interior, *Calamagrostis langsdorffi*, which sends its panicles up on tall stems to a height of 5 or 6 feet. If this grass is cut when it reaches the heading stage it makes excellent and nutritious hay.

The writer would recommend the growing of oat hay whenever practicable. Properly cured it is the equal of timothy in point of nutritive value. The yield is heavy and one is always sure of a crop. If sown thickly, about 100 pounds to the acre, the stems will not be unduly thick. It should be cut soon after flowering when the grain is passing into the milk stage. Fine patches of alsike and white clover were seen in various yards and fields about Fairbanks, which prove that these clovers survive the winters under a good covering of snow.

There has been a gradual growth in agriculture nearly everywhere throughout the Tanana Valley. Those who began with small gardens have extended them. Those who found markets have undertaken to supply them. Horse feed is one of the important crops in the interior and oat hay has been found to meet the need. It is easily grown, a sure crop, and produces a fairly good yield.

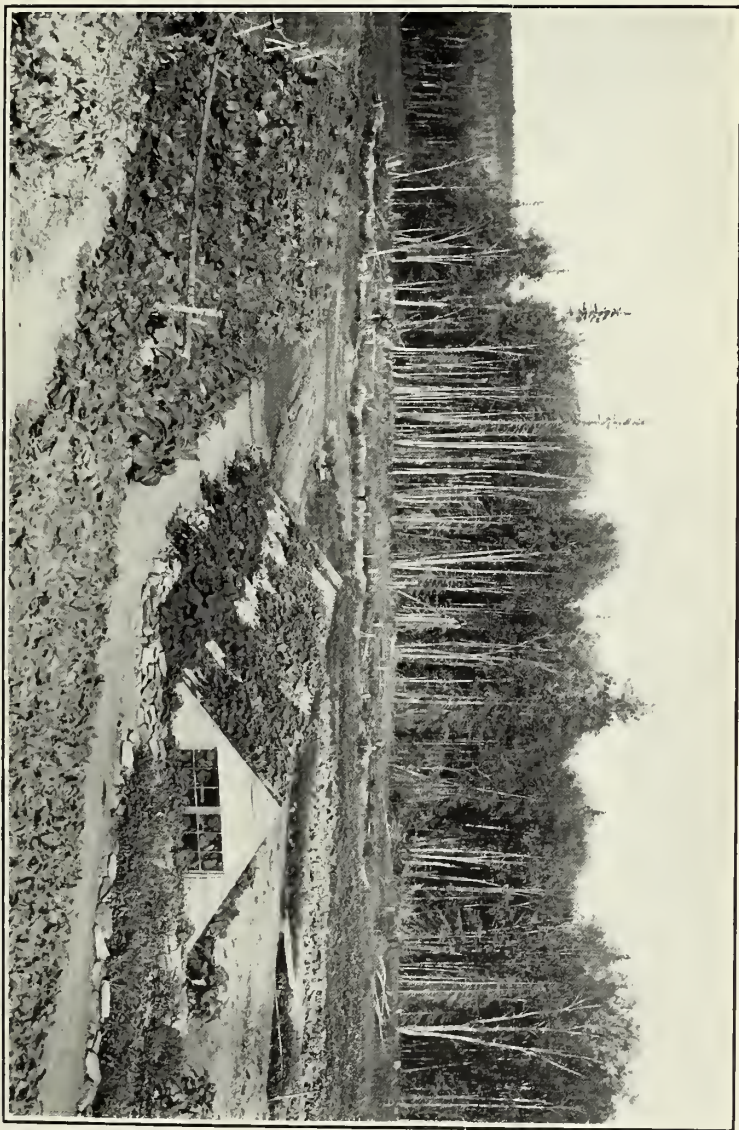
At Hot Springs, Tanana, Mr. J. F. Karshner, who homesteaded the place, has associated with him Mr. Frank Manley, and together they have greatly extended the clearing; have built a hotel and baths; raised chickens on an extensive scale; grow large quantities of vegeta-



FIG. 1.—FLOWER GARDEN AT FAIRBANKS.



FIG. 2.—PULLING CARROTS, HOT SPRINGS FARM.



PORTION OF HOT SPRINGS FARM ON THE TANANA.

bles for the Fairbanks market, and raise what feed they need for their horses and cattle (Pl. III). There is at present no market for grain, hence they raise only grain for feed, but the past season arrangements were made with them to grow, for the experiment station, half an acre of Romanow spring wheat on shares. It matured perfectly. Other homesteaders have located in the same neighborhood and are gradually developing their holdings.

WINTER WHEAT MATURED.

In the fall of 1906 some wheat was accidentally scattered in a lot in the town of Fairbanks, probably from a passing wagon, as drivers would sometimes take a short cut through that lot, and the wheat was probably intended for feed. Later the lot was fenced and this accidental seeding thus protected from further disturbance. When the snow left the wheat sprang up; it grew to a height of about $3\frac{1}{2}$ feet, and it had ripened by August 25. The heads were of average size and the grains were plump. With permission of the owner, Doctor Hall, some seed was gathered for use at the Rampart Station. It appeared to be a variety of Velvet Chaff. If wheat will survive the winters and mature when scattered accidentally there is no apparent reason why it should not do so when sown in proper fashion.

AGRICULTURAL DEVELOPMENT ON THE YUKON.

At Eagle the writer saw a field of about 15 acres in grain and was given samples of perfectly mature spring wheat, barley in several varieties, and Black Finnish oats. The owner, Peter Lundin, has been farming there for several years and is gradually extending the area under culture. The gardens at Eagle have been mentioned so often that it seems trite to refer to the subject; but during the summer of 1907 they were but little short of perfection.

Mr. J. F. Gay had a large garden in which potatoes were the leading crop. He grew a variety known as Irish Cobbler which he pronounced early, a good yielder, and of fine quality. His other crops were equally good. No better peas could be desired than those found in the garden of C. A. Thompson. U. G. Myers and a score of others also had excellent gardens.

At Circle Mr. N. Rassmussen had a 10-acre field of oats which he grew for his pack horses. There were also several good little gardens.

At Tanana there were not only excellent gardens, but one man had undertaken to grow potatoes on a large scale, and another had several acres of oats for hay.

At Novikaket there are successful gardens, and likewise at Nulato and at Anvik.

At Holy Cross Mission, Koserefsky P. O., there are now under cultivation between 12 and 15 acres, besides having a large natural

meadow of hay land. The mission now has upward of a dozen head of cattle reared on the place, among them some famous milkers. The mission people make their own butter and cheese and raise their own beef. They not only raise the potatoes and other vegetables needed for the large orphanage and school, but they produce a surplus which is taken by the boats on the river. The writer visited the place in 1901 when they had 4 or 5 acres in garden. The development here is but typical of the growth elsewhere.

THE FIRST SELF-BINDER AND THRESHER IMPORTED.

The year 1907 marks an epoch in northern agriculture in that it witnessed the importation of the first self-binder and the first threshing machine brought to the Yukon. They went to the Canadian side of the line, however, and not to Alaska. They were imported by Messrs. Minard and Grenier, two Frenchmen from Montreal, who farm 200 acres near the mouth of the Pelly River in latitude 62° 40' N. Grain growing is said to be successful at that place, and these machines were imported for harvesting the large crop this year. The Pelly River empties into the Yukon at Fort Selkirk, which place has been noted for the farming of W. H. Swinehart. There is no doubt that grain can be matured here when it has been matured for seven years in succession at Rampart, three degrees farther north. But the introduction of the self-binder by practical farmers is a further evidence of the agricultural possibilities of the Northland.

An American named C. E. Carpenter and his two sons have each taken up a homestead on the Yukon a little above Fort Selkirk. Mr. Carpenter informed the writer that he was satisfied with the agricultural prospects of that region.

At Dawson the farm of Mr. W. S. Paddock was visited. He farms 100 acres besides operating a number of greenhouses for the growing of tomatoes, cucumbers, and things which can be successfully forced. Dawson prices are only 25 to 30 per cent of the prices realized at Fairbanks, but the wages for labor are also less. Mr. Paddock grows mainly vegetables and feed, and in addition to supplying dealers he also retails his produce in a store of his own in the city. Potatoes sold wholesale at 6 cents a pound and turnips at 5 cents. Oat hay sold at from \$60 to \$100 a ton according to supply.

AGRICULTURAL DEVELOPMENT IN THE COPPER VALLEY.

The example of the experiment station has induced quite a number of settlers to venture in the same lines. Learning that oat hay could be grown at a profit, several parties have made clearings and are now growing oat hay either for their own use or for sale. Mr. Charles W. Bram is one of these. He is located at Gakona, about 35 miles

above Copper Center, in a place where the conditions are favorable to farming. He has 25 acres under cultivation and his main crops are oat hay and potatoes, but he also raises many vegetables. It is reported that he was very successful this past season.

Mr. William Klitzke, located at Taslina, 8 miles north of Copper Center, is farming on a small scale. He is raising oat hay and vegetables. He has made arrangements to put in an irrigating plant to supply him with water during the dry season, the water being raised by means of a wheel operated by the current.

Mr. George Rorer has taken up a homestead at Dry Creek, 16 miles north of Copper Center, and is preparing to farm on a large scale. He already has several acres under cultivation and is raising oat hay and vegetables. He has built a dam on a small creek above his farm with a view to irrigating his place, which in this case can be done by the gravity system.

Mr. John McCrary, a homesteader at Copper Center, has 6 or 7 acres under culture and is gradually extending the clearing. His crops this year were oat hay and vegetables.

Mr. William J. Kale has taken up a homestead a few miles south of Copper Center and is preparing to raise oat hay.

The Indian mission and school, a Government institution, located at Copper Center, has 6 acres under cultivation which are utilized in growing feed and vegetables.

Mr. F. J. Bingham has a homestead at Willow Creek, 11 miles south of Copper Center. He has a dozen acres under culture, on which he raises vegetables and grain hay, and he will continue to extend his clearings.

All of these, it will be noticed, have begun work in the neighborhood of the experiment station. Most, if not all, of the road-house keepers between Valdez and Fairbanks make an effort to grow the vegetables required by the public who stop at their inns, and several of them also grow oat hay on a small scale. A meal for a horse in that region costs as much as a meal for a man. Hay is sold at 25 cents per pound.

At nearly all the Signal Corps telegraph stations gardens are maintained. The miners also raise gardens at their diggings, and even the prospectors who roam over the country do so when they are located for a season in any particular region.

Agricultural development has begun, and it is safe to say that it will never stop. It will go on and grow continually until the country is settled. Alaska would have been settled already with a considerable farming population if the economic conditions had not been wholly adverse to such settlement.

Without roads and without transportation facilities a vast empire like Alaska can not be settled except in the gradual way here noted.

ECONOMIC CONDITIONS A BAR TO SETTLEMENT.

The conditions which prevent the development of agriculture are economic, not agricultural.

It is self-evident that the interior of Alaska can not be settled by the class of people best suited to exploit and develop the latent agricultural capacity when it costs from \$200 to \$500 to move a ton of freight 100 miles inland from the port of debarkation, or more, in proportion to distance; when a seat in the stage from Valdez to Fairbanks costs \$150 and meals and sleeping quarters from \$5 to \$10 a day in addition; when sugar, salt, oatmeal, and other equally plain articles are 25 cents a pound, bacon 40 to 60 cents a pound, condensed milk 75 cents a can, and everything else in proportion. Only people with money, or at least with an assured income, can meet these conditions. The chief assets of pioneer farmers are a vigorous constitution and indomitable courage, but these alone will not pay freight, move families, procure equipments, or buy provisions. The class of people who homestead land do not as a rule have much money, and taking into account the expenses which homesteaders in Alaska must incur, comparatively few can come here. Corporations and trading companies are not in business for philanthropic purposes; it is useless to look to them for reductions to settlers, although such a step would result to their advantage, since an increase in population would mean an increase in business. The Government alone can remedy these economic conditions and it can do it by liberal encouragement of railroad building. Alaska is a large country. It will take at least three trunk lines to open up the valleys of the Copper, the Yukon, the Sushitna, and Kuskokwim. The building of wagon roads which the Government has begun will prove of great benefit to the country. Improved transportation facilities are Alaska's greatest need. When these are provided the economic conditions which now bar settlement will gradually right themselves. Competition will bring down prices and the cost of living. Labor will be more plentiful; mines which it will not pay to work at present will be opened; resources now untouched will be exploited; business will increase; markets for farm produce will develop, and the country will be settled. Without improved transportation facilities the country will remain stagnant; only the richest mines can be worked, and the country will be deserted when these are exhausted.

WORK AT THE SITKA STATION.

PROPAGATION AND DISTRIBUTION OF NURSERY STOCK, ETC.

This work was continued during the past season. It is deemed to be one of the most important lines of work that we can undertake at this stage of the country's development.

A few trees have been growing here now for four seasons and some for five seasons. In a good fruit country some of these trees should begin to bear fruit. They have not begun to bear here, and it is not possible to say whether they will or will not bear in the near future.

APPLES.

Of the apples, Hyslop and the Yellow Transparent bloomed the past season, but bore no fruit. These two varieties are outstripping other sorts in vigor and growth. The Whitney and Peerless are also promising well, but nearly all the others mentioned in the notes on nursery stock submitted herewith are doing poorly, which would indicate that they are not adapted to the climate. The excessive rainfall and continuous mild weather prolongs the growing season until long into October. The young wood is soft and succulent, and moderately cold weather the following winter kills it. Only varieties which are adapted to a moist, cool climate can thrive in the coast region of Alaska. The climatic conditions of the interior are of course entirely different. There the rainfall is in most places too scant for normal growth, though varieties which mature their wood early may do well. The trees sent to settlers in the interior during the past couple of years are not sufficiently well established to afford evidence on which to base conclusions. Many who have planted them report that they are doing well. Many others report the trees are dead. Nearly all complain that the trees arrive too late in the season to get a good start before frost and that for this reason many died during the first winter. There is no remedy for this under present conditions. We can not afford to pay expressage on the trees and it is impossible to send packages to the interior points of Alaska by mail except during the four months when the rivers are open. River navigation does not begin until some time in June, and packages mailed from Sitka about the first of June reach their destination at interior points from the last of June to the last of July, according to transportation facilities. If the trees are not already dead when they arrive it is evident they can not make much growth that year. A few do survive and by continuing the efforts data will be eventually gathered sufficient to prove or disprove that fruit trees can be grown in the interior. One thing is certain, only the so-called summer varieties can mature in Alaska. In the interior the

season is too short and in the coast region the summers are too cool to mature fall and winter apples. Another thing which the experiments here seem to indicate is that it will be useless to try to grow standard trees. Dwarf trees which keep close to the ground are likely to succeed best. At the Sitka Station apple trees are peculiarly subject to fungus diseases. This is probably due to the moist climate. It has been necessary to spray very frequently through the summer, and even then some varieties suffer greatly.

CHERRIES AND PLUMS.

The young cherry trees did not show as much fruit the past season as they did in 1906. The tender wood was somewhat injured by the rather cold winter of 1906-7, and the trees were heaved by frost so that they all had to be reset in the spring. In addition to these unfavorable circumstances the weather was cold and wet during the blooming period, which was a sufficient cause for the nonformation of fruit. It is believed, however, that cherries will mature in the coast region in protected places. Of the four varieties growing, the Early Richmond and the English Morello are the best.

A few sample trees of a dozen varieties of plums are at the station. The trees are still small and none of them have fruited. It is too early to express an opinion as to what they may do.

BUSH FRUITS.

Currants and raspberries are propagated and distributed in large numbers. Gooseberries have not been distributed freely because they are comparatively expensive to buy and they are difficult to propagate, inasmuch as they do not grow readily from cuttings; but currants, gooseberries, and raspberries do remarkably well in Alaska not only in the coast region but also in the interior. A number of varieties of each of these bush fruits are growing at the Sitka Station. Notes on their behavior are given elsewhere in this report (pp. 37-39). There is a marked difference in the behavior of different varieties, and this is particularly true of gooseberries and raspberries. All are not equally adapted to the climate. It is therefore necessary to grow many sorts, side by side, in order to learn which will do the best. The Cuthbert raspberry has done particularly well in the coast region. Some sorts are almost failures, like the Superlative and Champlain. The Cuthbert has been cross-fertilized with the wild salmon berry (*Rubus spectabilis*) and a number of these hybrid seedlings are now growing. A few of them are large enough to fruit the coming season. These plants show great diversity in appearance. The salmon berry is a vigorous grower and produces a very large berry, which, however, is entirely devoid of both aroma and flavor, but it is an excellent

berry for culinary purposes. It is too soft to bear shipment. It is hoped that at least a few plants of the cross may inherit the good qualities of both parents.

Among gooseberries the Downing and Houghton have been fairly successful at the Sitka Station, but the Whitesmith, a large English variety, exceeds them all, native and foreign varieties. There is a wild black gooseberry indigenous to Alaska which is probably susceptible to improvement. We have secured a number of seedlings with a view of experimenting with them. Currants could not thrive better anywhere than they do in the coast region of Alaska. The red currant as well as several species of black currant are indigenous to Alaska. The wild red currant of the Kenai Peninsula is as fine and as productive a bush as the cultivated currant; racemes are long and the berries large. A number of the wild bushes have been planted at the station, but they do not grow nearly as well under culture as they do in their native jungles. Seedlings of this wild currant have been raised for future work. Several varieties of cultivated currants have been successful everywhere as far as they have been tried, both on the coast and in the interior.

STRAWBERRIES.

Last year's report has an outline of the experiments under way with strawberries, namely, the hybridizing of the cultivated varieties with the native wild species. During the last four or five years about two dozen sorts have been introduced and tested. Of these only four sorts are now alive, namely, the Magoon, Bismarek, Enhance, and Hollis. The last name has been adopted from lack of knowledge of the real one. The variety was obtained two years ago from Mrs. Helen Althouse, of Hollis, Prince of Wales Island. She did not know the name and it has not been identified with any known variety. It is a valuable sort, in that it is both hardy and productive. All of the varieties here named have been used as the mother plants in the formation of crosses with the wild Alaska berry, and there are now perhaps 2,000 plants of these crosses. None of them have borne fruit yet, but some of the older plants are expected to fruit next summer. It is a remarkable fact that, although the seed came from the cultivated varieties, the young plants nearly all resemble the wild species in leaf and in habit of growth. The object of the experiment is to develop, if possible, a variety which will be as hardy as the wild and as productive as the cultivated one. The native wild berry is of very excellent quality and it is very firm, so it would make a good shipper, but the plants are shy bearers and the berries are too small for commercial purposes although they are unusually large for wild berries. They are about the size and shape of a medium-sized thimble, although some of them attain $1\frac{1}{4}$ inches in length.

VEGETABLES.

The growing of vegetables except on a very limited scale has been discontinued. A number of varieties of potatoes are grown for the purpose of testing them further and also to produce seed potatoes for distribution. Last year the area planted was small and the amount raised was consequently also small. The season was not favorable for potatoes. The Freeman, Gold Coin, and some recently imported Norwegian potatoes promise the best. The Extra Early Ohio which did so well last year did not come up to the same standard of yield this year. It suffered much from a rot which reduced the yield.

ROOT MAGGOTS.

Turnips, ruta-bagas, radishes, and to a lesser extent cabbage, cauliflower, and all other cruciferous crops suffer from the attacks of root maggots (*Pegomya* sp.). The pest appears to be on the increase and complaints have been received from all parts of the Territory. In very many places the pest is so bad that none of these root crops can be grown. The root maggots appear to infest the soil, only new ground being exempt. When once introduced they seem sure to continue and grow more destructive each successive year. It is not practicable in Alaska to inject carbon bisulphid, kerosene, or other solutions at the roots of individual plants. Labor and material cost more than the crop is worth.

In the meantime the station has received a turnip which seems to be immune. It is a variety introduced from Sweden by the Bureau of Plant Industry, U. S. Department of Agriculture, and known as Petrowski, No. 19554. It was grown last season at the Sitka, Rampart, and Copper Center stations, and at none of them was this variety attacked, although other varieties grown alongside of it suffered badly. It is a medium-sized yellow-fleshed, firm turnip of fair quality, but not a heavy yielder. It will be tried further, and if it should continue to prove immune this is the turnip for Alaska. It is believed that its immunity is due to the fact that the leaves lie flat on the ground, close about the plant, in such a way as to possibly prevent the fly from getting at the crown to lay its eggs.

BASKET WILLOWS AND ORNAMENTALS.

The station has a small area of basket willows which are doing extremely well. They are being propagated and distributed in the hope that they may be useful both to settlers and natives. Indians are basket makers, and if they could be induced to utilize these willows and to grow them the whole community would be benefited. A few ornamental bushes are being propagated. Chief among these is

the *Rosa rugosa*, a Japanese species of the rose, which is very hardy and very ornamental. In this latitude it begins to expand its large, single, rose-colored flowers in July and continues to bloom until autumn. It forms a dense bush with a thick mass of foliage, which is of itself ornamental. It is not easily propagated; usually only a small percentage of the seeds grow, and these frequently lie in the ground a year before they germinate. The most satisfactory way of propagating it is by layering old plants, but this process is slow.

Another ornamental bush which promises to be of value to Alaska is the Tartarian honeysuckle. It is hardy and blooms freely.

Lilacs will do fairly well in protected places, but they are not at their best in Alaska, and the same is true of the Snowball. A few bushes of the Eglantine, or sweetbrier, have been grown for several years. Whenever there is zero weather, as was the case last winter, they are killed to the ground, but they sprout again in the spring. They have never shown flowers.

Of the perennial flowering plants the columbine is perhaps the most satisfactory. It is indigenous to the coast region of Alaska and all varieties seem to thrive here to perfection.

OFFICE WORK.

The amount of office work at the headquarters station is continually increasing. The correspondence with settlers throughout the Territory is large, and with the disbursing accounts, the required reports, and the work of the other stations, it is all that two persons can do. A permanent clerk and typewriter is much needed. Thus far the station has depended upon temporary assistance from persons living in town, but often for long periods at a time there is nobody to be hired.

WORK AT THE KENAI STATION.

Kenai Station has been devoted to stock breeding and dairying, as was reported last year. Except for a small garden and some grass plats, the whole of the 26 acres under culture was sown to oats for hay. The season was backward and field work could not begin until May 20. The whole summer was cold and rainy. The only period of favorable growing weather was the month of July and the first half of August. The oat crop grew slowly until July, when it began to improve, and by August 15 about half the crop was headed out. The stand was thin, due to the fact that the crop tillered but little. The crop was cut for hay between September 5 and 10 and yielded only about $\frac{3}{4}$ of a ton per acre. The rainfall was 10 inches for September, and it was therefore hard to cure the hay. The oat hay was supplemented by about 3 tons of hay from native grasses cut during the summer.

The cattle, both pure-bred Galloways and the natives, have done exceedingly well during the past year. They came through the winter of 1906-7 in fair condition and soon fattened up on pasture.

Five cows and one heifer calf, all pure-bred Galloways, were landed at Kenai May 13, 1906. These have since dropped 7 calves—3 bulls and 4 heifers—all of which have made good growth. The native cows dropped 4 calves during the past year—2 bulls and 2 heifers. The total number of cattle at the station October 1, was 22 head. As noted elsewhere, 11 of the Galloways were transferred to Kodiak Station in October, because the herd was too large for the amount of feed raised. The two horses at the Kenai Station have maintained themselves well and have kept in good flesh all through the working season without grain.

The dairy work has not been pushed as vigorously this year as last, because there was but little demand for butter, while, on the other hand, there was a demand for milk, owing to much sickness among the natives. There has been no additional clearing of land, or other improvements, because, as noted elsewhere, it is the plan to transfer the entire equipment to Kodiak Station in the spring and to temporarily close the Kenai Station.

In the garden the Early Ohio potatoes raised from seed grown at the station were the better producers this year. Gold Coin and Garfield varieties were rather inferior in yield. Lettuce, radishes, and turnips did well.

Of the several grasses timothy grew best, while orchard grass and redtop made a fair showing.

A report on the Dairy Practice at Kenai Station, by Mr. P. H. Ross, is submitted herewith (see p. 62). It is a clear statement of the methods we have followed at that station with much success, and which should be followed by everybody who keeps but a few cows. Its perusal by the owners of small dairies in Alaska is recommended.

WORK AT THE COPPER CENTER STATION.

In spite of the dry and cool weather which characterized the whole growing season in the Copper River Valley practically all the grains matured. This was due to early seeding. The ground had all been fall plowed and was ready to seed as soon as the frost went out of the surface. This made it possible to begin seeding in the latter part of April and the seeding of spring grain was completed May 6. This early seeding prolonged the growing season and nearly all of the grains had matured when the first killing frost occurred August 24.

Judging from the experience during the last five years in the Copper Valley killing frosts occur earlier in that valley than they do at Rampart, in the Yukon Valley, $3\frac{1}{2}^{\circ}$ farther north. Killing frosts have oc-

curred every year in August. The earliest date has been August 14. When it holds off as late as August 24, as it did the past season, there is a chance for grain to mature if it has been seeded early, as in this instance.

There are 40 acres under cultivation at this station; of this, 29 acres were seeded to grain of all sorts, 1 acre was in garden, including five small patches, which were allowed to be used by 5 Indians in practicing gardening, and 10 acres were in grass of various sorts.

Of the 29 acres in grain about 20 acres were seeded with common oats for hay; the remaining 9 acres were divided into numerous small plats devoted to varieties.

Of the wheats the Early Riga was most promising, followed by Velvet Chaff. All of these two varieties matured and a few heads matured of the Saskatchewan Fife and Ladoga. Romanow spring wheat only matured a few heads on high ground. All the barleys matured. The most promising variety tested was the Pamir, No. 18922, the seed of which was imported by the U. S. Department of Agriculture. It came originally from a very high altitude in the Himalaya Mountains. Champion was also very promising and came next in earliness to the Pamir, while Hanna, Manshury, Sisolsk, and Chevalier come next in order named.

Of the oats tried Finnish Black has again proved itself the most desirable variety. The seed of this variety was originally imported from Finland by the United States Department of Agriculture. It is a tall, vigorous variety with black seed. Every indication is that it is par excellence the oat for Alaska. Burt Extra Early also matured. Several other varieties matured in part. They were all grown in a small way.

Of the winter grain Amber winter rye matured. Kharkov winter wheat, an imported Russian variety, was winterkilled at this station, probably because the snowfall was insufficient to protect it. Common oats sown for hay were cut August 18. Some were mature by that date and practically all would have matured in another week. As it was, they made a heavy, excellent quality of hay. The straw was short and the yield light on account of the lack of rain.

GRASSES.

The cultivated grasses, patches of which have been seeded every year since 1903, have not been a conspicuous success. Smooth brome grass (*Bromus inermis*) and wheat grass (*Agropyron tenerum*) are the only two species which have not been winterkilled. The brome grass after the first season has not been heavy enough to cut, but the wheat grass last season made a splendid yield. Both of these plats were saved for seed. Timothy has partly winterkilled and other com-

mon grasses, grown at the station, such as tall meadow oat grass, velvet grass, orchard grass, and redtop have winterkilled completely, and the same is true of alfalfa, also red, white, and alsike clovers.

Realizing that the production of feed is one of the most important problems in the interior, we shall in the future attempt to cultivate native Alaskan species of grasses and forage plants. With this end in view the station superintendent, Mr. C. W. H. Heideman, has made collections of seeds of upward of 40 species of native grasses and leguminous plants. Of some only a very little seed could be secured and of others several pounds were gathered. Some of these seeds have already been put in the ground and the remainder will be sown as soon as the ground can be worked in the spring. They will be tried in plats, side by side under identical conditions, and a comparative study will be made as to their value for meadow and pasture. Such other imported grasses from northern regions as can be obtained will also be tried.

IRRIGATION NECESSARY.

The question of growing stock feed in the Copper River Valley is simply a question of water. On the uplands the vegetation is light, due to lack of moisture. In the lowlands along streams, around lakes, and in moist places the native grasses are vigorous enough to yield heavily, but these marsh grasses are unfortunately mostly sedges and do not have much value for feed. It is becoming more and more apparent that irrigation is necessary in the Copper Valley and must be resorted to to obtain anything like normal yields whether of grains or grasses. A rainfall of between 3 and 4 inches during the months of May, June, July, and August is not sufficient for the production of good crops.

DEVELOPING EARLY VARIETIES OF GRAINS.

The plan outlined in former reports for the development by the selection and propagation from the earliest maturing heads of varieties of grain which will mature in 90 days or less, if possible, has been inaugurated. The past season careful selection was made of the heads which showed the first signs of ripening in each of the many varieties grown and ripe heads were secured from all of them. Even though the main portion of a variety failed to mature there were always some heads or plants which were earlier than the average, and these were gathered and labeled to form the foundation for similar selections in succeeding years. Of each variety a selected head will be planted separately and the resulting plants from each studied in comparison with others. The selection will be continued until the all-important point of earliness is secured. In so doing



FIG. 1.—HOUSE AT RAMPART STATION, AND SOME OF THE EXPERIMENTAL PLATS.

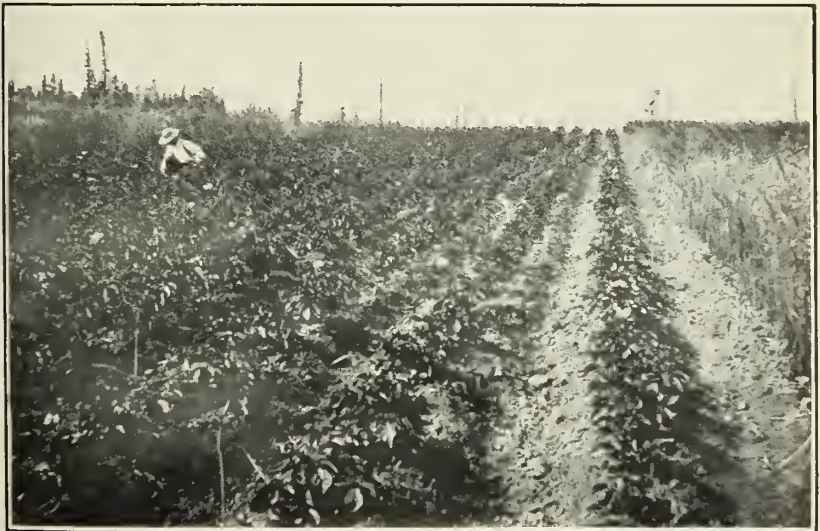
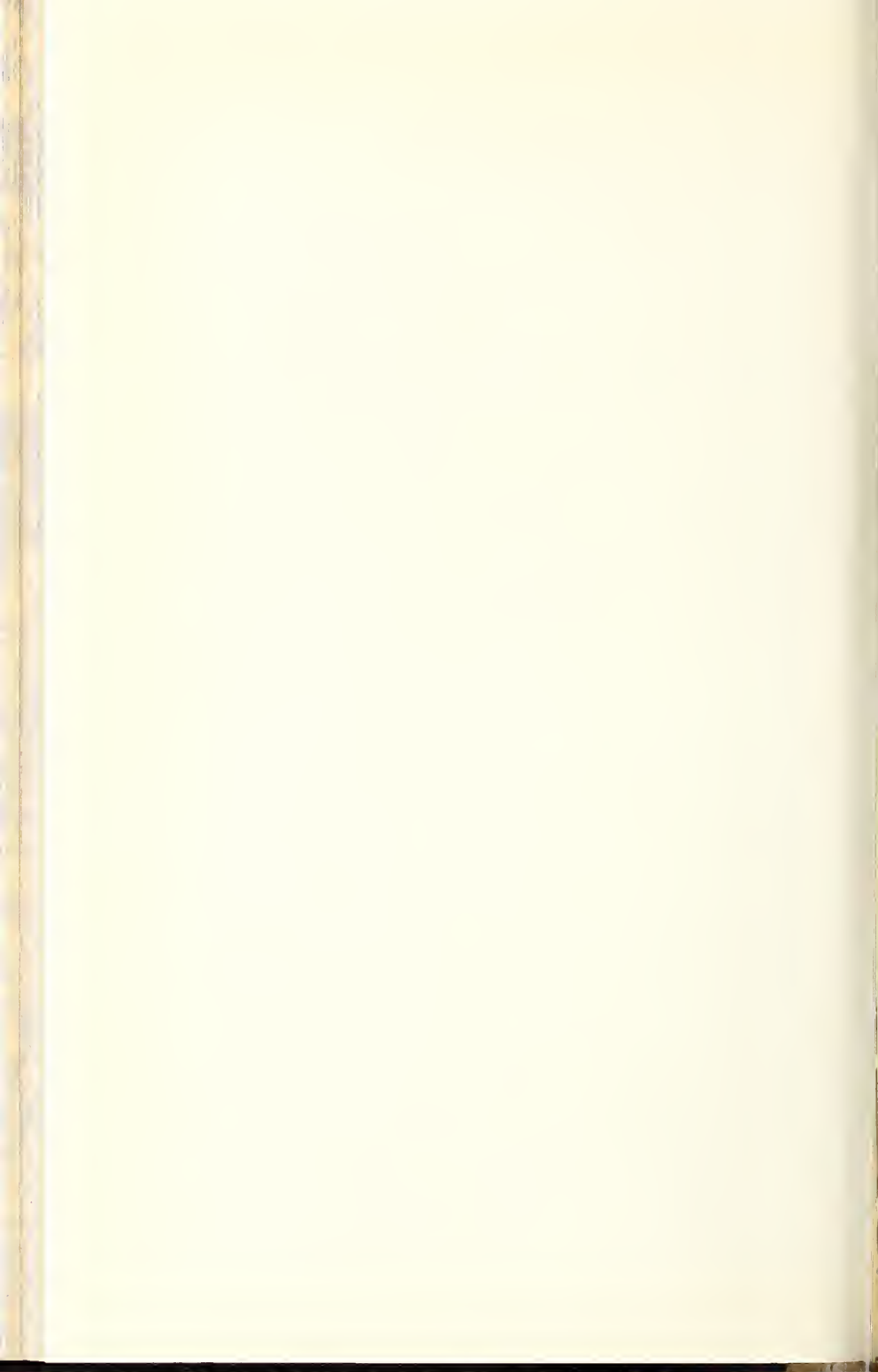


FIG. 2.—POTATOES, RAMPART STATION.



other important qualities will constantly be kept in view, as, for instance, vigor and healthiness of the plant, productiveness, size and weight of kernels, stiffness of straw, etc. As yet the work has not proceeded far enough to report on it. The report of C. W. H. Heide-man, who has had charge of the station since March 1, 1907, is submitted herewith (see p. 49).

WORK AT THE RAMPART STATION.

It is a pleasure to be able to report the gratifying success in all the farming undertakings at the Rampart Station during the past season. For some reason as yet unexplained the climatic conditions in the Ynkon Valley appear to be more favorable to crop production than they are in the Copper River Valley. Killing frosts occur about two weeks later and the rainfall is nearly double what it is at Copper Center.

At Rampart the first killing frosts the past season did not occur until September 6, and the total rainfall for the months of June, July, and August was 7.31 inches. This slight difference in the length of the growing season and in the amount of rainfall is sufficient to make the difference between success and partial failure.

The special agent visited the Rampart Station in the month of August and found everything in most excellent condition. At the time of his arrival, August 6, several varieties of barley had begun to turn a rich golden yellow, while the oats, wheat, and vegetables looked very promising.

During the winter Superintendent Rader completed the station house. He built a neat little cottage of five rooms and a frost-proof cellar. It is a frame structure, built with a view to exclude the cold. The roof is corrugated galvanized iron, because this could be shipped in more cheaply than shingles. By the time spring work began the house was completed. He also built a substantial log barn and implement shed. (Pl. IV, fig. 1.)

The season at Rampart is unfortunately usually late in opening up. Plowing can seldom begin until the middle of May and sometimes later. Seeding did not begin until May 24, which is nearly a month later than the beginning of seeding at Copper Center. Again, the soil is of a clayey nature and tenacious of moisture, and it takes a longer time to get in condition for cultivation in the spring than is the case with a sandy soil.

The area under cultivation was about 7 acres, of which about 3 acres were seeded to oats to be cut for hay for winter feed for the team, and the remaining 4 acres were devoted to grains of many kinds, some potatoes, and a small patch of vegetables. Some 3 acres more are being cleared, but owing to the frequent rains it was diffi-

cult to burn the stumps and moss which cover the ground. If the season proves dry enough next June it is planned to burn over about 20 acres adjoining the present clearing, proper precautions being taken that the fire does not spread to the timber. In clearing land fire is the most economical as well as the most efficient servant that can be employed. In the summer of 1906 the station was supplied with a stump puller, which is operated by one horse and the leverage is produced by winding a wire rope about a drum. It was found to be a very efficient machine for stumps of the size found there, which range from 6 to 18 inches in diameter. There are but few of the latter size, however.

THE GRAIN CROPS.

Kharkov winter wheat matured at the Rampart Station, but on the other hand, winter rye which has matured heretofore was winterkilled, and so were so-called winter oats and winter barley. The rye was killed because the snow blew off the patch and thus exposed it to severe cold. That the oats and barley should winterkill might be expected. Nine varieties of barley matured, although none of them was seeded before May 24. The earliest of all these is the variety imported from the Himalaya Mountains, Pamir No. 18922, which was so successful at the Copper Center Station. Of all these the well known Manshury, which we have grown for several years, is one of the best.

Out of six varieties of oats the Finnish Black proved to be the best. It was practically all ripe when the killing frost occurred, September 6. A few varieties ripened only in part. This is accounted for by the late seeding.

Emmer, Einkorn, and Proso (the latter a variety of Russian millet) did not ripen, but this was to be expected.

The same plan for the development of the early maturing varieties of grain which was mentioned above has been adopted at Rampart Station and will be carried out with care.

The following grasses matured seed at the Rampart Station: Kentucky blue grass, redbtop, English rye grass, meadow foxtail, timothy, smooth brome (*Bromus inermis*), and tall meadow fescue. The following were failures: Orchard grass, velvet grass, and perennial rye grass.

The most important vegetable crop in the interior is the potato, and this grew satisfactorily at the Rampart Station. Potatoes have been grown and perpetuated from home-grown seed in the Yukon Valley for a number of years. There is no longer any question as to whether potatoes can be grown there or not. The question now is to find varieties best adapted to the several regions. Owing to the difficulty and expense of shipping in seed potatoes, those which

have so far been grown there have been bought from the stores and shipped in for eating purposes. The Early Rose is perhaps the most common sort, but it is not the best potato for that country. The Rampart Station has now been supplied with seed of 35 varieties, most of them grown at Sitka, to be used in trial tests next year. It is hoped to find some among them which are adapted to the conditions. The other common vegetables did well.

NOTES ON NURSERY STOCK, VEGETABLES, ETC., AT SITKA STATION FOR 1907.

By R. W. DEARMOND.

The investigations with nursery stock and vegetables have been continued along the usual lines at the Sitka Station. These include not only tests of varieties, but those that are found adapted to Alaskan conditions are being propagated for distribution. More than 12,000 fruit trees and shrubs have been sent to various parts of the Territory and reports on some of the lots are given in the letters from the station's cooperators. In determining the adaptability of some of these fruit trees and small fruits to Alaskan conditions records have been made of their condition at the beginning of the season, at different periods throughout the summer, and at the end of the annual growing season. A detailed report of them is given herewith.

APPLES.

During the winter of 1906-7 the ground heaved badly from the action of the frost. This raised the trees, injuring the root system, leaving roots much exposed. After frost had left the ground and the soil again settled it was found necessary to transplant many of the trees. This was true not only of the apples but of all the trees and plants in the open field. The new growth killed back from a third to a half by freezing.

The spring was rather late, and the trees remained in a dormant state until well toward the middle of May. Growth was slow in starting and the leaves were affected with a fungus which greatly retarded healthy growth. They were sprayed with Bordeaux mixture seven times during the season, the almost continuous rainy weather making it necessary to spray often. Growth was more rapid during the latter part of the season, but with most varieties it is too soft to withstand freezing weather. In order to check growth so that the wood might harden up, in the hope that fruit buds might form, the tips of all growing branches were pinched back in the latter part of August. Some few trees were stripped of their leaves the first of October that the wood might become seasoned before freezing.

From the standpoint of hardiness, growth, and general thriftiness the Whitney crab, Yellow Transparent, Hyslop, and Peerless stand first, with but slight difference between them.

Whitney: May 15, seventeen trees, buds well advanced. June 1, in leaf, quite vigorous. July 1, 3 inches growth. August 1, thrifty, 7 inches growth, uninjured by fungus. October 12, 15 inches growth. Nine trees stripped of leaves.

Yellow Transparent: May 15, nineteen trees, buds swelling rapidly. June 1, full leaf, all vigorous. July 1, look well, 2 inches growth. August 1, 10 inches growth, not injured by fungus. October 15, 15 inches growth, appear thrifty, new wood well hardened.

Peerless: May 15, seven trees, buds well advanced. June 1, full leaf, look well. July 1, 3 inches growth. August 1, slightly affected by fungus, 5 inches growth. October 15, 12 inches growth, in good condition.

Martha: May 15, seven trees, buds swelling. June 1, in leaf, not vigorous. June 15, sprayed with Bordeaux mixture, making little growth. July 1, badly afflicted with leaf fungus, sprayed, 3 inches growth. August 1, 5 inches growth. October 12, 10 inches growth, new wood very soft.

Lowell: Four trees, slow in starting. June 1, very backward. June 15, in leaf, not vigorous. July 1, slightly injured by fungus, no growth. October 12, three trees made 3 inches growth, wood very soft.

Red Astrachan: May 15, twelve trees, buds swelling slightly. June 1, in leaf, three trees promise thrifty growth. July 1, very backward. August 1, poor condition, badly affected by fungus. October 12, made some growth, new leaves give trees a thrifty appearance.

Tetofski: May 15, nine trees, rather backward. June 1, in leaf, look well. July 1, all look vigorous, but growth is short. August 1, 4 inches growth, somewhat injured by fungus. October 15, leaves have a thrifty look, 6 inches growth.

Eureka: May 15, fourteen trees, slow in starting. June 1, in leaf, look healthy. July 1, very little growth. August 1, 4 inches growth, considerably injured by fungus. October 15, two trees doing nicely, making 1 foot growth, others in poor condition.

Sylvan Sweet: May 15, sixteen trees, buds beginning to open. June 1, nearly full leaf, appear vigorous. July 1, 2 inches growth. August 1, 5 inches growth. October 15, 11 inches growth, thrifty appearing, wood very soft.

Brier Sweet: May 15, two trees, yet dormant. June 1, very backward. June 15, badly affected by leaf fungus. July 1, some growth, very unthrifty. August 1, in bad condition. October 15, seemingly about dead.

Pyrus baccata: May 15, thirteen trees, buds opening. June 1, full leaf. June 15, some individuals affected with leaf blight. July 1, 5 inches growth, few individuals rather backward. August 1, healthy, 15 inches growth. October 15, 2 feet growth, wood rather soft.

Transcendent: May 15, two trees, buds well advanced. June 1, full leaf. July 1, 5 inches growth. October 15, 18 inches growth, thrifty, wood soft.

Hibernal: May 15, four trees, buds opening. June 1, in leaf, healthy. June 15, one tree has cluster of bloom buds. July 1, 3 inches growth, petals falling, no fruit set. October 15, 10 inches growth, in fair condition.

Hyslop: May 15, five trees, slow in starting. June 1, leafing out, leaves rather yellow. June 15, bloom buds ready to open. July 1, 1 inch growth, petals falling, no fruit set. October 15, 4 inches growth, leaves falling naturally, wood well hardened.

Raspberry: May 15, eighteen trees, buds well advanced. June 1, in full leaf. July 1, some trees making growth, others are not, all look healthy. August 1, badly affected by fungus. October 15, 4 inches growth, looking well.

Red June: May 15, fifteen trees, well advanced. July 1, 2 inches growth. August 1, four trees badly affected by fungus, others slightly, 5 inches growth. October 15, 1 foot growth, looking very well, wood very soft.

Jenkins: June 1, four trees, leafing out. August 1, very slow growth. October 15, in poor condition.

Maiden Blush: May 15, two trees, very little advance. June 1, leafing out. July 1, very little growth. August 1, unthrifty. October 15, appears healthy, very little growth.

Early Harvest: May 15, fourteen trees, buds swelling. June 1, in leaf, thrifty. July 1, vigorous looking, but little growth. August 1, look well, growth slow. October 15, all look healthy, wood very soft.

Northwest Greening: May 15, two trees, yet dormant. June 1, leafing out. July 1, poor condition. October 15, small spindling growth, very poor condition.

Okabena: May 15, buds well advanced. June 1, full leaf, thrifty. July 1, 3 inches growth. August 1, 5 inches growth, healthy. October 15, 10 inches growth, healthy, wood soft.

Green Sweet: May 15, one tree, buds swelling. June 1, in leaf. July 1, 2 inches growth. August 1, affected by fungus, not doing well. October 15, 8 inches growth, healthy, wood very soft.

Patten: May 15, seven trees, well advanced. June 1, in full leaf, healthy appearance. July 1, 2 inches growth. August 1, 7 inches growth. October 1, 1 foot growth, wood fairly well hardened.

Jessie: May 15, seven trees, buds well advanced. June 1, full leaf, growing nicely. July 1, 4 inches growth, badly affected with leaf fungus. August 1, 7 inches growth. October 1, 1 foot growth, wood in fair condition, some leaf fungus.

Princess Louise: May 15, one tree, yet dormant. June 1, buds developing slowly. June 15, full leaf, unthrifty. August 1, very poor condition. October 15, very little growth, unthrifty.

Duchess: May 15, ten trees, buds well advanced. June 1, full leaf vigorous, making growth. July 1, 4 inches growth, affected with fungus. October 1, 10 inches growth, wood rather soft.

Walbridge: May 15, one tree, yet dormant. June 1, buds swelling. June 15, in leaf, very unthrifty. August 1, healthy appearing, making growth. October 15, 15 inches growth, wood very soft.

North Star: May 15, two trees, buds swelling. June 1, in leaf, healthy. July 1, very little growth. August 1, 4 inches growth, affected by fungus. October 15, 1 foot growth, wood very soft.

Jeanette Winter: May 15, four trees, buds dormant. June 1, leafing out. June 15, in full leaf. July 1, very little growth. August 1, very bad condition, leaf fungus bad, sprayed. October 15, looks thrifty, no fungus, 3 inches growth, wood very soft.

APPLE TREES ON NATIVE STOCK, GRAFTED 1904.

Lowell: May 15, five trees, starting growth. June 1, in leaf, healthy appearance. July 1, 3 inches growth. August 1, leaves badly affected by fungus. October 15, 10 inches growth, wood very soft.

Duchess: May 15, rather backward. June 1, in leaf, leaves yellow. July 1, in poor condition. August 1, 3 inches growth. October 15, 4 inches growth, very poor condition.

Okabena: May 15, buds swelling. June 1, in leaf, leaves small, unthrifty. July 1, in poor condition. August 1, making some growth. October 15, in fair condition, growth short.

NEW GRAFTS.

Very few of the apple grafts grew. The scions were taken from trees grown here and the wood proved too soft for successful grafting.

APPLE TREES IN BREWERY LOT, DWARFS.

The dwarf trees have done better and present a much better appearance than standard trees of the same varieties planted near them. Of the nine varieties. Keswick Codlin is the most satisfactory. This variety starts growth early, and grows steadily throughout the season; the wood hardens and the leaves fall naturally before freezing weather.

Keswick Codlin: May 15, three trees, buds opening. June 1, full leaf, healthy. July 1, 3 inches growth. August 1, 1 foot growth. October 15, 15 inches growth, leaves falling, in good condition.

Sweet Bough: May 15, three trees, buds well advanced. June 1, full leaf, appears healthy. July 1, growth very slow. August 1, 6 inches growth. October 1, 1 foot growth, leaves falling, in fair condition.

Tetofsky: May 15, three trees, buds swelling. June 1, in full leaf, healthy. July 1, no new growth. August 1, 4 inches growth. October 15, 6 inches growth, poor condition.

Golden Sweet: May 15, three trees, making start. June 1, full leaf, healthy. July 1, 3 inches growth. August 1, 1 foot growth. October 1, 15 inches growth, leaves falling, in good condition.

Primate: May 15, two trees, rather backward. June 1, nearly full leaf. July 1, no growth. August 1, 3 inches growth. October 1, no additional growth, healthy appearance.

Early Harvest: May 15, three trees, well advanced. June 1, healthy appearing, no growth. July 1, 2 inches growth. August 1, 6 inches growth. October 15, 15 inches growth, in fair condition.

Fanny: May 15, three trees, very backward. June 1, in leaf, unthrifty. July 1, making some growth. August 1, 6 inches growth. October 15, 1 foot growth, leaves dropping, in fair condition.

Yellow Transparent: May 15, three trees, buds opening. June 1, healthy appearance, no growth. July 1, no growth. August 1, 6 inches growth. October 15, 1 foot growth, fair condition.

Red Astrachan: May 15, three trees, very little sign of growth. June 1, in poor condition. July 1, very unthrifty. August 1, nearly dead. October 15, made small growth, very poor condition.

STANDARD TREES.

Fanny: May 15, five trees, buds opening slowly. June 1, in leaf, unthrifty. July 1, 2 inches growth. August 1, 6 inches growth. October 1, 1 foot growth, in fair condition.

Golden Sweet: May 15, five trees, well advanced. June 1, but one tree appears thrifty. July 1, 3 inches growth. August 1, 8 inches growth. October 15, 1 foot growth, wood very soft.

Sops of Wine: May 15, five trees, yet dormant. June 1, four trees showing signs of life. June 15, very backward, in leaf. July 1, one tree dead, others alive. August 1, one tree making growth. October 15, very poor condition.

Summer Rose: May 15, five trees, badly injured by frost, yet dormant. June 1, two trees leafing out, others starting. July 1, two trees making growth, one dead, others in very unthrifty condition. August 1, in poor condition. October 15, very poor condition.

Sweet Bough: May 15, five trees, well advanced. June 1, four very thrifty, others coming on slowly. July 1, 2 inches growth. August 1, 8 inches growth. October 15, 1 foot growth, in fair condition.

Early Strawberry: May 15, five trees, badly winterkilled. June 1, two show signs of growth, others dead. July 1, one tree making growth. August 1, very unthrifty. October 1, one tree made some growth, wood very soft.

Benoni: May 15, five trees, well advanced. June 1, full leaf, thrifty. July 1, 2 inches growth. August 1, 6 inches growth. October 15, 1 foot growth, fair condition.

William Favorite: May 15, three trees, dormant. June 1, in leaf, unthrifty. July 1, one tree healthy, making 2 inches growth; one tree in bloom, unthrifty, making no growth. August 1, one tree made 6 inches growth, no fruit set. October 15, very poor condition.

Primate: May 15, five trees, injured by frost. June 1, in leaf, rather backward. July 1, making some growth. August 1, 2 inches growth. October 15, 6 inches growth, in fair condition.

Transcendent: May 15, trees in nursery row, buds opening. June 1, in full leaf. July 1, 4 inches growth. August 1, in poor condition. October 15, 1 foot growth, leaves falling, in fair condition.

CHERRIES.

The cherries, like the apples, were much injured by the heaving of the ground, tearing and exposing the root system, so that it was necessary to reset nearly every tree. No fruit set this season, there being so much rainfall that the blossoms were not fertilized.

The new growth was cut back in September, and some of the trees have been stripped of their leaves in order that the wood may harden.

It is difficult to say which of two varieties stands first. English Morello makes the most vigorous growth, but winterkills worse than the Early Richmond. These two easily lead.

English Morello: May 15, eight trees, yet dormant, badly injured by frost, much of last season's growth being entirely killed. June 1, starting slowly. June 15, blooming, very backward. July 1, two trees dead, four in bloom, two just leafing out. August 1, making good growth, very thrifty, yet blooming. October 15, growing vigorously, 3 feet growth, wood too soft to withstand freezing.

Early Richmond: May 15, twenty trees, very little signs of starting, badly winterkilled. June 1, buds beginning to open. June 15, in leaf, bloom beginning to open. July 1, in full bloom, trees very thrifty. August 1, strong, thrifty growth. October 15, 2 feet growth, wood very soft.

Ostheim: May 15, yet dormant. June 1, badly winterkilled, leaf buds slowly opening. June 15, bloom buds opening, leaves slow in developing. July 1, petals nearly all fallen, in full leaf. August 1, making thrifty growth. October 15, 2 feet growth, wood very soft.

Dyehouse: May 15, yet dormant, badly winterkilled. June 1, few individuals leafing out. June 15, very backward, few bloom buds. July 1, in poor condition. August 1, making strong growth. October 15, 18 inches growth, very soft.

Sand Cherry: May 15, buds swelling. June 1, in leaf. July 1, 2 inches growth, in full bloom. August 1, 6 inches growth, no fruit set. October 15, 10 inches growth.

Juneberry: May 1, buds swelling. May 15, full leaf. May 23, in bloom. June 1, very thrifty, full bloom. July 1, 4 inches growth, still blooming, fruit setting well. August 1, 6 inches growth, yet blooming. October 15, 15 inches growth, fruit small and inferior in quality, many root suckers.

PLUMS.

Of the dozen varieties of plums now in the nursery, but one proved worthy of cultivation. The May Day stands far superior to the other varieties.

May Day: May 1, three trees, buds well advanced. May 15, in full leaf. May 20, in bloom. June 1, 4 inches growth. June 15, fruit failed to set. July 1, 8 inches growth. August 1, 18 inches growth. October 15, leaves falling naturally, wood well hardened, in excellent condition.

Forest Garden: May 15, one tree, buds swelling. June 1, in leaf. July 1, 3 inches growth. August 1, 4 inches growth. October 15, poor condition.

Tomahawk: May 15, one tree, buds swelling. June 1, leafing out but backward. July 1, growing but little. August 1, 4 inches growth. October 15, in good condition.

Sayles: May 15, two trees, well advanced. June 1, full leaf, thrifty. July 1, 4 inches growth. August 1, 15 inches growth. October 15, 2 feet growth, wood very soft.

Hawkeye: May 15, two trees, well advanced. July 1, 4 inches growth. August 1, 15 inches growth. October 15, 2 feet growth, wood very soft.

Odegard: May 15, five trees, buds opening. June 1, full leaf. July 1, 3 inches growth. August 1, 10 inches growth. October 15, 18 inches growth, in good condition.

Wyant: May 15, two trees, buds opening. June 1, in leaf. July 1, 4 inches growth. August 1, 18 inches growth. October 15, 3 feet growth, wood very soft.

Desota: May 15, four trees, buds swelling. July 1, 4 inches growth. August 1, 15 inches growth. October 15, 18 inches growth, wood very soft.

Rollingstone: May 15, one tree, buds opening. July 1, 5 inches growth, leaves somewhat blighted. August 1, 18 inches growth. October 15, 2 feet growth, wood rather soft.

Scout: May 15, one tree, rather backward. June 15, bloom buds well developed. July 1, full bloom, 2 inches growth. August 1, 5 inches growth, no fruit set. October 15, 6 inches growth, good condition.

Mixed Americana: May 15, sixty-five trees, badly frozen back, backward in starting. July 1, 4 inches growth. August 1, 18 inches growth. October 15, 2½ feet growth, wood very soft.

Seedling of Wyant: May 15, nineteen trees, very backward, badly winterkilled. June 1, leafing slowly. July 1, 5 inches growth. August 1, 18 inches growth. October 15, 3 feet growth, wood very soft.

Seedling of Cherry Plum: May 15, thirty-five trees, badly winterkilled, backward in starting. July 1, 4 inches growth. August 1, 18 inches growth. October 15, 2 feet growth, wood very soft.

GOOSEBERRIES.

Of the American varieties, Smith Improved has proven the best. It makes a better growth and the wood becomes more mature than that of other varieties.

Smith Improved: May 1, buds well advanced. May 15, full leaf, in bloom. July 1, 6 inches growth. August 1, 1 foot growth, fruit ripening. October 15, leaves falling, wood in good condition, fruit sweet and good, skin smooth and thin.

Champion: May 1, buds opening. May 15, in full leaf bloom. June 1, fruit well set. July 1, 4 inches growth, a few branches blighted by fungus. August 1, no additional growth, fruit sweet and good, skin tough and leathery. October 1, no additional growth, have a healthy appearance.

Red Jacket: May 1, buds swelling. May 15, full leaf, does not appear thrifty. June 1, blooming. June 15, fruit well set. July 1, 2 inches growth, fruit nearly

full size. August 1, thrifty looking, no additional growth. August 15, fruit juicy, rich and of good quality, skin rather tender. October 15, 4 inches growth in fair condition.

Native Black Gooseberry, from Skagway: May 1, well advanced. June 1, in bloom. July 1, 1 foot growth, failed to set fruit. August 1, 2 feet growth. October 15, no additional growth, leaves falling.

Of the English varieties none equals the Whitesmith. It makes its growth early, maturing the wood; it bears heavily and produces a large, well-flavored berry, though it has a thick skin.

Whitesmith: May 1, buds opening. May 15, full leaf, in bloom. June 1, fruit well set. July 1, 5 inches growth. August 1, no additional growth, fruit excellent, fruit picked in September, some seeds planted and some stratified.

Triumph: May 1, buds opening. May 15, full leaf, not vigorous, few blooms. June 1, plants rather backward, some fruit. August 1, 4 inches growth, fruit smooth, large, good. October 15, 6 inches growth.

Columbus: May 1, yet dormant. May 15, leafing out. June 1, full leaf, few blooms. June 15, no fruit set, very backward. October 15, made no growth, poor condition.

Industry: May 1, buds swelling. May 15, in leaf, full bloom. June 1, some fruit set. July 1, 3 inches growth. August 1, 4 inches growth. October 15, in fair condition.

CURRENTS.

Of the black currants grown at this station Lee Prolific is the most hardy. It is as productive as the Russian Black or Champion and the fruit is much superior to them in flavor. The black currants have proven a little too tender for this climate and are rather scant bearers. They also suffer badly from a fungus.

Lee Prolific: May 15, well advanced. June 1, full leaf, in bloom. June 15, fruit not well set, bushes thrifty. July 1, 1 foot growth. August 1, 2 feet growth, somewhat affected by leaf fungus. August 24, fruit gathered. October 15, leaves dropping, wood in better condition than other black varieties.

Russian Black: May 15, buds opening. June 1, full leaf, in bloom. June 15, very little fruit set, bushes thrifty. July 1, 15 inches growth. August 1, 2 feet growth, leaf fungus quite bad. August 24, fruit picked. October 15, leaves dropping, wood in fair condition, growth more upright than other varieties.

Champion: May 15, buds opening. June 1, very thrifty, in bloom. June 15, some fruit setting. July 1, 1 foot growth. August 1, 2 feet growth. August 24, fruit picked, large berries, mild flavor. October 15, 3 feet growth, wood very tender.

Common Black: May 15, buds opening. June 1, thrifty. July 1, 1 foot growth, in bloom, badly affected with mildew. August 1, 3 feet growth, no fruit set, bushes thrifty. October 15, leaves dropping, wood rather soft.

Native Black, from Sunrise: May 15, rather slow in starting. June 1, in leaf, some plants seem thrifty, few blooms. July 1, 4 inches growth, some fruit. August 1, 8 inches growth, fruit dropped. October 15, 1 foot growth, in good condition.

Native Wild Black: May 1, buds well advanced. May 15, in leaf. July 1, 18 inches growth. October 15, 2 feet growth, leaves falling, wood in good condition.

Manitoba Amber: May 1, buds well advanced. June 1, full leaf. July 1, half of the bloom killed by mildew, 18 inches growth. August 1, 2 feet growth, fruit ripening. October 15, growth rather tender.

Seedlings of Kenai native: May 1, badly injured by heaving, reset. May 15, plants making a start. July 1, 4 inches growth. October 15, 15 inches growth, in good condition, too small to fruit.

Red Cross has given the best results of the red varieties grown here. It is an upright grower of medium height. Here it is hardy, the fruit is somewhat acid but of good size and color. The clusters are medium.

Red Cross: May 1, buds swelling. May 15, in leaf. June 1, full leaf, beginning to bloom. July 1, 6 inches growth. August 1, 15 inches growth, fruit ripening. August 23, fruit picked. October 15, 18 inches growth, leaves dropping, wood in good condition.

Wilder: May 1, dormant. May 15, starting. June 1, full leaf, some bloom. June 15, very little fruit. July 1, 6 inches growth. August 1, 1 foot growth. August 24, fruit ripe, very poor. October 15, 18 inches growth, leaves falling, wood in good condition.

Ruby Castle: May 15, buds opening. June 1, full leaf, few blooms. June 15, very little fruit. July 1, 1 foot growth. August 1, 2 feet growth, leaves rather yellow. August 24, fruit ripe, small berries, poor flavor. October 15, leaves dropping, wood in good condition.

Victoria: May 1, dormant. May 15, in leaf. June 1, blooming. June 15, fruit well set. July 1, 1 foot growth. August 1, 18 inches growth, fruit ripening. August 24, fruit picked, berries small, poor flavor. October 15, leaves falling, wood in good condition.

Fay: May 1, dormant. May 15, buds opening. June 1, in bloom. July 1, 15 inches growth. August 1, 2 feet growth. August 24, fruit picked, small berries very acid. October 15, in good condition.

RASPBERRIES.

On the station grounds are grown seven varieties of red raspberries, of which the Cuthbert stands as the best. It is the only variety that really comes to perfection here. The others have as yet not proved of much value. The wet weather prevents perfect fertilization and in consequence the berries are few and not well developed.

Cuthbert: May 1, dormant. May 15, buds swelling. June 1, in leaf. July 1, in bloom, making good growth. August 1, new canes 4 feet high. August 15, fruit ripening. October 7, last fruit picked. October 15, canes 6 feet long, plants suckered freely.

Turner: May 1, canes injured by freezing. May 15, buds swelling. June 1, leafing, rather backward. July 1, beginning to bloom. August 1, new canes 3 feet long, fruit small and poorly set. September 15, fruit not worth picking. October 15, canes 5 feet long, leaves falling, wood in good condition, very few suckers.

Fuller: May 15, very backward. June 1, leafing out, tips slightly winter-killed. July 1, blooming freely. August 1, new canes 3 feet high, poor, bloom imperfectly fertilized, yet blooming. September 15, fruit not worth picking. October 15, new canes 4 feet long, suckers more freely than the Turner.

Miller Favorite: May 15, yet dormant. June 1, leafing out, very backward, tips of canes winterkilled. July 1, few blooms. August 1, new growth short, fruit very poor. October 15, new growth 3 feet, very few sprouts, fruit not worth picking.

Loudon: May 15, buds swelling. June 1, leafing, rather backward, slightly winterkilled. July 1, blooming freely. August 1, new canes 2 feet high, fruit small but better than Fuller. October 15, canes 3 feet long, wood very soft, very few suckers.

Champlain: May 15, dormant. June 1, leafing, slightly winterkilled. July 1, making good growth, flower buds in abundance. August 1, new canes 3 feet, fruit small and inferior. October 15, new canes 5 feet high, wood very soft, very few suckers.

Orange: May 15, dormant. June 1, backward. July 1, some growth, few flower buds. August 1, new canes 2 feet long, fruit poor. October 15, new canes 3 feet long, wood soft, few suckers.

Superlative: May 15, dormant. June 15, in full leaf. July 15, in bloom. August 1, new growth 2 feet long, fruit very poor, yet blooming. October 15, new growth 4 feet long, wood tender, few suckers.

Native Salmon Berry (*Rubus spectabilis*) × Cuthbert seedlings: Doing fairly well; some made growth of 3 feet; plants vary greatly; none have been planted in the open ground as yet.

POTATOES.

The potatoes were planted from May 15 to 18, inclusive, and were all up by June 15. The stand was good, though all were slow in coming through the ground. Some were affected with a fungus which attacked the vine at the ground and worked downward to the tuber, starting it to rot. The yield this season was not normal, owing to the cool summer and overabundance of rain. The tubers run more even in size with a greater percentage of first grade than in former seasons.

Of the varieties which have been grown here for some years the Freeman gives the most satisfactory results. It is the earliest maturing and the heaviest yielder. This season it yielded at the rate of 225 bushels per acre, with 60 per cent first, 20 per cent second, and 20 per cent third grade.

Garfield: Yielded at rate of 130 bushels per acre, with 50 per cent first, 25 per cent second, and 25 per cent third grade.

Extra Early Ohio: Rate of yield per acre, 103 bushels, 50 per cent being first, 21 per cent second, and 29 per cent third grade.

Norway No. 1: Late this season; potatoes dug October 3, rate of yield 325 bushels per acre, 80 per cent first grade.

Norway No. 2: Later this season than last; dug October 12, 80 per cent first class, yield at the rate of 317 bushels per acre.

Norway No. 3: Dug October 12, 60 per cent first class, yield at rate of 171 bushels per acre.

Lincoln: Not a good potato, rather small; dug September 23, yield at rate of 142 bushels per acre, 40 per cent first class.

Eureka: Practically a failure, very few and poor.

Early Harvest: Somewhat affected by fungus disease; potatoes dug September 23, yield at the rate of 38½ bushels per acre, 60 per cent first grade.

Red River White Ohio: The tops were small, though they appeared healthy; these yielded at the rate of 31 bushels per acre, all first grade.

Extra Early Pioneer: This variety was the earliest to come through the ground; rate of yield 60½ bushels per acre, 60 per cent first grade.

Pat's Choice: Very poor, practically a failure; all potatoes third grade.

Carmen No. 3: Made better showing this season than ever before; rate of yield 128 bushels per acre, 90 per cent first grade.

Early Ohio: Rate of yield 63 bushels per acre, 70 per cent first grade. The plants were very vigorous throughout the season.

Ohio Jr.: Plants smaller than other varieties of Ohio, all first grade; rate of yield 97 bushels per acre.

Irish Cobbler: Very poor, no first grade potatoes; rate of yield 31 bushels per acre.

Bovee: Strong thrifty vines; rate of yield 60 bushels per acre, 50 per cent first, 34 per cent second, and 16 per cent third grade.

Bnrpee Early: Not a first-class potato. The plants were small; rate of yield 72½ bushels per acre, 40 per cent first, 30 per cent second, and 30 per cent third grade.

Early Market: Considerably affected by stem rot; rate of yield 180 bushels per acre, 60 per cent first, 30 per cent second, and 10 per cent third grade.

Vornehm: Most thrifty looking plants in the field; rate of yield 106 bushels per acre, 70 per cent first, 22 per cent second, and 8 per cent third grade.

White Beauty: Plants very small though strong appearing; rate of yield 55 bushels per acre.

Extra Early Triumph: Above the average in growth of vine; yield at the rate of 80 bushels per acre, 70 per cent first, 20 per cent second, and 10 per cent third grade.

White Mammoth: Plants small, affected by stem rot; rate of yield 52 bushels per acre, 40 per cent first, 28 per cent second, and 32 per cent third grade.

Early Michigan: A strong grower, a few hills killed by stem rot; average yield 60½ bushels per acre, 70 per cent first, 20 per cent second, and 10 per cent third grade.

Hamilton Early: Plants small, many hills killed by stem rot; yield averaged 43½ bushels per acre, 40 per cent first, 40 per cent second, and 20 per cent third grade.

Extra Early: Vines very vigorous; yield at rate of 108 bushels per acre, 70 per cent first, 25 per cent second, and 5 per cent third grade.

Gold Coin: Plants smaller than average; yield at rate of 70 bushels per acre, all first grade.

Banner: Very slow in coming up, plants very small and spindling; yield at rate of 75 bushels per acre, 30 per cent first, 40 per cent second, and 30 per cent third grade.

Vigorosa: Plants very uneven in growth, some killed by root rot; yield at rate of 34 bushels per acre, 20 per cent first, 70 per cent second, and 10 per cent third grade.

PEAS.

Russian Pea No. 20911: Planted June 10. July 1, good stand 4 inches high. August 1, 2 feet high, beginning to bloom. September 1, not many pods setting. September 20, picked 5 pounds. October 9, picked 4 pounds, vines killed by frost October 16, vines about 6 feet high. A strong grower but a light producer. The pods are medium long and well filled.

Russian Pea No. 20912: Planted June 10. July 1, good stand, 4 inches high. August 1, 2 feet high, few blooms. September 1, 5 feet high, yet blooming, very few pods. These peas grew over 5 feet high and are light bearers here. The pods are large, but the pea grows slowly. None were ready for use when frozen October 16.

TURNIPS.

Petrowski Turnip No. 19554: Planted June 15, were up by July 1, made a slow growth. This is a round smooth yellow turnip of excellent quality, tender and juicy. It was uninjured by a root maggot which practically destroyed all other varieties of turnip.

Gratscheff Turnip No. 19555: This turnip has a bright red skin, is flat and somewhat ribbed. It reaches a larger size than the yellow; root maggots worked on it badly.

Iceland Turnip No. 19795: Planted June 15. August 1, average growth with other varieties; worked on badly by root maggot. This turnip greatly resem-

bles ruta-bagas in color and form of leaf and general appearance. Ruined by root maggot.

Turnip No. 20483: Much the same in every way, form of growth and general appearance, as Iceland turnip No. 19795. A description of one answers perfectly for the other.

Purple Top Strap Leaf: Planted June 15. Made a good growth until attacked by root maggot.

STRAWBERRIES.

Native Yakutat: May 1, good condition, starting growth. June 1, bloom buds well developed. June 15, in bloom. July 1, yet blooming, fruit setting well. July 24, first ripe fruit picked. August 1, ripening freely. October 15, in good condition, not so many new plants as usual.

Hollis: May 1, plants much injured by frost heaving the ground. May 15, plants pressed into place and starting growth. June 1, bloom buds well advanced. June 15, in bloom. July 1, blooming freely, fruit setting well. July 24, first ripe fruit picked. August 1, fruit ripening freely, berries ill shaped. October 15, in excellent condition for winter, large number of new plants.

Bismarck: Transplanted July 15. October 15, in good condition, many new plants.

Enhance: Transplanted July 15. October 15, in good condition, very few new plants.

Magoon: Transplanted June 1. August 1, making good growth, but not many runners. October 15, in good condition, few new plants.

Hybrid Hollis \times Yakutat: July 20, transplanted to open ground. October 15, good strong plants, in good condition; resemble the Yakutat berries in form of plant and habit of growth.

ORNAMENTALS.

Rosa rugosa: May 15, uninjured by frost, buds swelling. July 1, growing thriftily, in bloom. July 15, branches layered to strike root, green cuttings placed in the forcing house with bottom heat failed to root. August 1, plants blooming freely. October 15, some plants yet blooming, seeds picked; some planted in flats, remainder stratified in sand.

Niobe willow: May 15, last season's growth killed back one-half, starting slowly. June 1, in leaf, rather slow. July 1, 1 foot growth. October 15, 4 feet growth, wood very soft, hardwood cuttings put out in the spring have done well.

Mountain ash: May 15, uninjured by frost, buds swelling. June 1, leafing out. July 1, 18 inches growth. October 15, 3 feet growth, good condition, seedlings growing nicely.

Siberian sandthorn: May 15, little signs of starting. June 1, very backward, leafing out. July 1, 4 inches growth. October 15, leaves falling, wood well hardened.

Tartarian honeysuckle: May 15, buds well advanced. July 1, full bloom, 1 foot growth. October 15, 15 inches growth, seeds picked and planted, leaves falling, wood well hardened.

Siberian pea tree (*Caragana arborescens*): May 15, very little signs of growth. June 1, leafing out, rather backward. July 1, 4 inches growth. October 15, 15 inches growth, leaves falling, wood well hardened.

Eglantine: May 15, killed to the ground. June 15, starting growth. October 15, 2 feet growth, wood very soft.

Basket willow: May 15, tips winterkilled, buds swelling. July 1, 6 inches growth. October 15, 3 feet growth, hard wood cuttings put out in spring all grew, soft wood cuttings put out July 20 all grew.

Lilac: May 15, buds swelling. July 1, 3 inches growth. October 15, 15 inches growth, wood rather soft.

REPORT OF WORK AT RAMPART STATION FOR 1907.

By FREDERICK E. RADER, *Superintendent.*

Continuing the narrative of building operations in 1906, the log stable and tool shed then being built was so far completed by October 3 that it was put to use. The weather in October was unusually fine and the exterior of the cottage was completed, with the exception of a few finishing touches, and given a priming coat of paint by October 18. Work was then begun on the interior—the floors were laid, the cottage sheathed on the inside, and some of the partitions put in place. November 16 we moved into it and nearly all the remaining finishing work was done in the course of the winter (Pl. IV, fig. 1). It is a frame structure and we were somewhat apprehensive as to whether it could be kept comfortably warm during the winter, but it proved an entire success, as did also the cellar underneath the house. In the latter the thermometer registered between 32 and 34° F. the entire winter. During the very coldest weather a lamp was put in the cellar for a few hours at a time.

The remainder of the time during the winter was taken up with cutting and hauling wood and caring for the station team. No new buildings were erected during the summer, and no additions were made to the equipment of tools.

One laborer was employed from May 23 until October 1. On August 5 Mr. J. W. Gasser came to take charge of the station during the superintendent's absence the coming winter on a vacation. During August the superintendent assisted Prof. C. C. Georgeson in the preliminary work at Fairbanks. He returned to Rampart August 30 and remained at the station until September 14, when he started for the outside.

CLIMATIC CONDITIONS.

The autumn of 1906 was a good one. September was a fine month and the thermometer did not reach zero until October 20. There was very little snow before the end of the month. The winter was not marked by any long periods of low temperatures, —59° F. being the coldest, but frequent high winds made it disagreeable to be out of doors and drifted the snow so badly that it was difficult to keep trails open. Snow fell to a depth of 48 inches during the winter, which is more than the average. The preceding winter had the same amount.

By May 1 the snow was so far gone that sledding had to be discontinued and conditions pointed toward an early spring; but cold, frosty weather during the middle of the month checked the thawing and drying out of the ground to such an extent that plowing could not be started until May 21. The ice in the river broke May 9. This is the earliest breakup so far recorded.

The summer of 1907 could scarcely be called an average one. During July there was not one clear day and rain fell in measurable quantities on twenty days; and likewise, out of the last eighteen days of August there was more or less precipitation on sixteen of them. During the night of July 31 and August

1 there was a rainfall of 1.97 inches, an unusually heavy rain for this season of the year. It caused some of the grain to lodge so badly that it never straightened up again. Also September 11 and 12 there were 1.25 inches of rain.

In the following table is given a summary of the weather record for the three growing months, June (21 days only for 1905), July, and August, for three years:

Summary of weather during growing season at Rampart.

| | 1905. | 1906. | 1907. |
|--|-------|-------|-------|
| Maximum temperature, degrees F. | 96 | 84 | 85 |
| Average mean temperature..... | 55.1 | 57.8 | 56.9 |
| Number of days with 0.01 inch or more precipitation..... | 31 | 22 | 47 |
| Rainfall, inches..... | 5.57 | 4.41 | 7.31 |
| Number of clear days..... | 19 | 23 | 22 |
| Number of partly cloudy days..... | 34 | 31 | 37 |
| Number of cloudy days..... | 30 | 38 | 33 |

The total rainfall of 7.31 inches for the three months of 1907 may not seem excessive, but it fell in frequent showers, and then, too, it must be borne in mind that it requires only a comparatively small amount of moisture in addition to that supplied by the constantly thawing ground to make the soil wet; and wet ground is cold, especially in this latitude. The average total annual precipitation is less than 12 inches.

The first killing frosts did not occur until September 6 and 7, when the thermometer fell to 24° and 20° F., respectively.

WORK OF THE SEASON.

The summer's work may be briefly summarized as follows: Seeding, caring for, and harvesting the crops; improvement of the road from the river to the station buildings; cutting out a screen of timber between the river and the site where the buildings and cleared ground are located; grading around the cottage; clearing new land; making hay to winter the team; and plowing all the cleared land in readiness for next season's crops.

A horse stump puller was used this year and it proved a great success. Owing to the very frequent showers, the moss and trash on the ground were kept almost constantly too wet to burn and the progress made at clearing new land was most unsatisfactory. Burning is depended upon to get rid of the moss, dead grass, weeds, etc., before the land can be cleared up for the plow. There is usually during the summer several dry periods when this can be done, but this year was an exception. The stumps have been pulled on several acres which could not be gotten ready for the plow, and preparations have been made for burning over a considerable area next year should the weather be dry enough at any time.

Cutting out the small timber between the station grounds and the river has made a great improvement in the appearance of the station, and it was the cause of much favorable comment this summer.

GRAIN CROPS, GRASSES, AND VEGETABLES.

Plowing was begun on May 21, and the principal part of the seeding was done on May 24, 25, and 27. Such of the land as did not dry out in time to be seeded to grain crops was sown to common oats. This, with such grain as did not ripen, was cut for hay. Notwithstanding the somewhat unfavorableness of the season, the grains did well. The failures were either new grains being tried for the first time or else those that have not matured heretofore. The damp, cloudy

weather during the latter part of August retarded ripening very much, but ten days of nice weather in September cured splendidly those varieties which did ripen.

The land was cropped this year for the third time and a very great improvement was noticeable in its productiveness. Aside from the garden very little of the land has been fertilized at all. The grain this year grew to a uniform height and the heads were of good length. This is a very encouraging feature. It shows what a beneficial effect cultivation alone has upon this soil.

WINTER GRAIN.

A small quantity of each of the following varieties of winter grain were seeded August 25, 1906: Kharkov winter wheat No. 12001,^a winter barley from Bulgaria No. 521, winter barley from Bulgaria No. 522, Tennessee winter barley, winter rye No. 11268, and Snoma winter oats No. 274. The seeding was made too late for this latitude, but the seed did not arrive until the above date, and the grains had a very poor start. It is not surprising, therefore, that only one variety survived the winter. It was the Kharkov wheat, and that can be accounted for perhaps because of the heavier covering of snow which it had. This is the first time in the history of the station that winter rye failed to live through the winter.

The following is noted regarding the Kharkov wheat: July 1, 20 to 24 inches high and heading; July 12, in bloom; August 25, first heads ripe; August 31, part of plat ripe and cut. The straw was about 36 inches high, the heads of good length, and the grain large and plump.

The following winter grains were seeded in 1907: August 6, winter emmer No. 19385; August 16, winter barley No. 386, winter barley No. 521, winter barley No. 522, Excelsior winter rye—Rampart seed, Amber winter rye—Rampart seed, Giant French winter rye—Rampart seed, winter rye No. 11268, Kharkov winter wheat—Rampart seed, Kharkov winter wheat No. 12001, Snoma winter oats No. 274. All of the above came up in from eight to ten days after seeding and made a good growth (Pl. V, fig. 1).

SPRING GRAIN.

Sixty-day oats: Seeded May 24; up June 6; July 9, heading; July 19, blooming; September 3, a few heads ripe; September 9, proved badly mixed with other varieties, cut for feed. It was hoped that this would prove a more promising variety. However, we have some pure seed now and it will be given another trial.

Swedish Select oats, from Copper Center Station: Seeded May 24; up June 3; July 13, 24 inches high, heading; July 29, in bloom; September 5, some of the ripest heads cut, 56 inches high, partially lodged; September 9, cut for feed. The plat as a whole did not get ripe but the heads which were selected will be seeded next year.

Banner seed oats, from Copper Center Station: Seeded May 24; up June 6; July 16, heading, 20 inches high; July 29, in bloom; September 5, ripest heads cut, 48 inches high, stands up well. Will be given another trial.

Finnish Black oats, from Copper Center Station: Seeded May 24; up June 4; July 13, height 22 inches, heading; July 27, in bloom; September 5, mostly ripe; September 9, cut. The ground had been fertilized some and was too rich. The oats grew too tall and lodged badly. It was an average height of 60 inches.

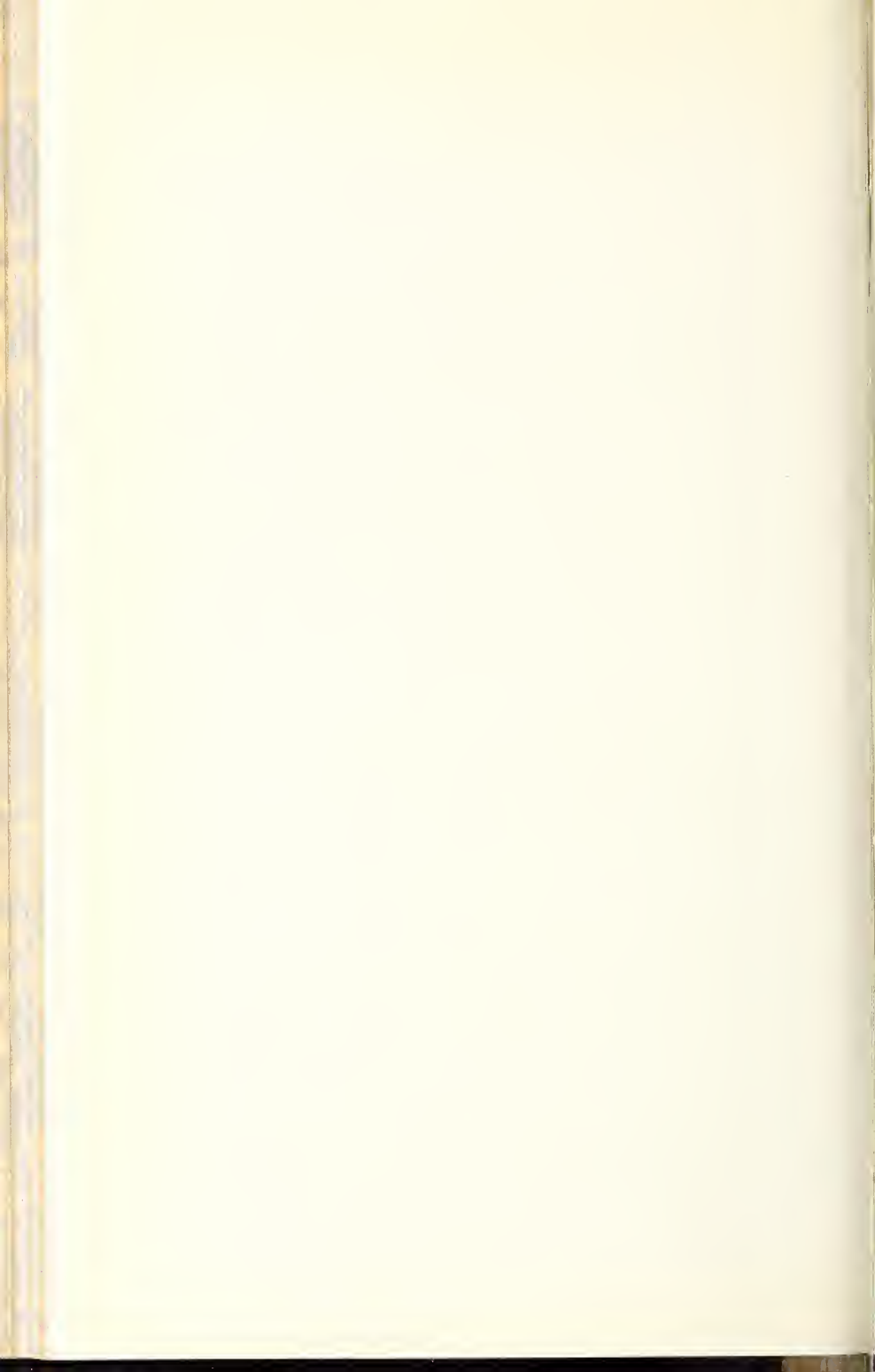
^a The numbers refer for most part to U. S. Department of Agriculture, Seed and Plant Introduction numbers.



FIG. 1.—FALL PLOWING, RAMPART STATION.



FIG. 2.—PUTTING IN OAT HAY, RAMPART STATION.



Burt Extra Early oats, from Copper Center Station: Seeded May 24; up June 4; July 6, height 20 inches, heading; July 13, fully headed; July 19, in bloom; September 1, first heads ripe; September 5, half of grain ripe. This is a small, slender-strawed variety and it always ripens unevenly.

Russian oats No. 10624: Seeded May 24; up June 7; July 19, heading; August 11, in bloom; September 7, did not ripen, injured by frost, cut for feed.

Burt Extra Early oats, Rampart seed: Seeded May 24; up June 7; July 10, heading; July 20, in bloom; September 3, half of grain ripe. It was badly mixed with barley and another variety of oats and was cut for feed (Pl. V, fig. 2).

Romanow wheat, from Hot Springs: Seeded May 24; up June 2; July 16, heading, height 22 inches; July 27, in bloom; September 5, some of the ripest heads selected; September 9, did not ripen, cut for feed. Ten days more of good weather would have ripened this variety. Will try to grow it again from the heads selected. The heads were very large; they had from three to seven grains to the spikelet and there were from ten to sixteen spikelets to the head.

Kubanka wheat, South Dakota Experiment Station, No. 5639: Seeded May 24; up June 5; July 13, height 24 inches, heading; July 29, in bloom; September 9, did not ripen.

Wheat No. 2398, from Galgalos, Caucasus: Seeded May 25; up June 3; July 14, height 20 inches, heading; July 29, in bloom; September 9, grain in soft dough, did not ripen, cut for feed.

Arnantka wheat, South Dakota Experiment Station: Seeded May 27; up June 6; August 11, in bloom; September 9, grain in soft dough, cut for feed.

Ghirka wheat, South Dakota Experiment Station, No. 1517: Seeded May 27; up June 5; July 18, height 18 inches, heading; July 27, in bloom; September 7, grain in soft dough, injured by frost, cut for feed.

Barley from Pamir No. 18922: Seeded May 24; up June 3; July 5, heading, 18 inches high; July 15, in bloom, height 28 inches; August 25, ripe; August 31, cut. This variety was grown for the first time this year and seems a very promising sort. The straw is short and thick and the heads are small.

Swedish barley No. 19557: July 1, height 22 inches, a few heads showing; July 19, beginning to bloom; August 23, first heads ripe; September 3, ripe and cut. It was seeded May 24 and came up June 2. This is an early variety tried for the first time this year. The straw grew to an average height of 40 inches and stood up well, and the heads were of good size and plump.

Barley No. 360, from Abyssinia: Seeded May 24; up June 3; July 10, heading; July 16, beginning to bloom; August 30, first heads ripe; September 3, ripe and harvested. It grew to an average height of 36 inches and has a medium length, plump head.

Barley No. 361, from Abyssinia: Seeded May 24; up June 2; July 9, heading; July 16, beginning to bloom; August 30, ripe heads selected; September 3, harvested. This is similar to No. 360.

Barley No. 362, from Abyssinia: Seeded May 25; up June 4; July 9, heading; July 13, half headed, height 26 inches; July 16, beginning to bloom; September 3, ripe and cut, grew to an average height of 36 inches. A black, two-rowed variety. All of the barleys from Abyssinia were grown this year for the first time and they seem very promising.

Barley No. 10583: Seeded May 25; failed to germinate.

Barley No. 10585: Seeded May 25; did not germinate.

Barley No. 10754: Seeded May 25; up June 5; July 13, heading, best 24 inches high; July 25, in bloom; September 5, ripe and cut. Thirty-six inches high, lodged some, good heads, a promising variety.

Barley No. 12709: Seeded May 25; up June 5; July 13, heading, height 22 inches; August 9, in bloom; August 30, grain mostly ripe; September 3, cut. This is a beardless variety and the first one so far tried. The station has had many inquiries regarding beardless barley and this may prove a good variety. It has a very soft, brittle straw, which may be a serious objection to it. It was blown flat to the ground by the storm of August 1 and never straightened up again.

Barley No. 15829: Seeded May 24; up June 4; September 5, only an occasional head showing. From the manner of growth this is evidently a winter variety. There was no description with the seed to indicate whether it was a spring or winter variety.

Lapland barley, Rampart seed: Seeded May 24; up June 5; July 13, average height 18 inches, beginning to head; July 23, in bloom; September 3, part of plat ripe; September 5, harvested, average height 42 inches. For some reason it ripened unevenly, perhaps because of some peculiarity of the soil. This variety has never failed to ripen.

Manshury barley, Rampart seed: Seeded May 24; up June 3; July 10, heading; July 19, blooming; August 31, ripe and part of plat cut; September 2, finished cutting. This is one of our very best varieties and it never fails to ripen. It grew to an average height of 40 inches, the heads were of good length and very plump (Pl. VI, fig. 1).

Emmer No. 1529: Seeded May 24; up June 4; July 16, heading; July 27, in bloom; September 9, grain in soft dough, did not ripen.

Einkorn No. 10474, South Dakota Experiment Station: Seeded May 27; up June 7; June 29, heading; August 16, blooming; September 5, still blooming, did not ripen.

Red Orenburg Proso No. 9423, Red Voronezh Proso No. 9424, and Black Voronezh Proso No. 9425 were seeded May 27 and came up June 15. They grew scarcely any until near the end of the season, reaching a height of about 6 inches. An occasional head came out but did not reach maturity. The common name for this plant is hog millet.

SELECTED GRAIN.

An effort is being made to propagate earlier maturing varieties of grain each year by selecting the earliest ripening heads of a variety and continuing the selection for a number of years. This was begun in 1906 with the following varieties, the selected seed of which was grown separately, and from these plats the earliest ripening heads were again selected for seeding next year. Of course, it is too soon yet to notice any real difference in the earliness of ripening.

Lapland barley, select seed cut August 20, 1906: Seeded May 24; up June 4; July 10, heading; July 16, beginning to bloom; August 23, first heads ripe; August 28, ripe; August 31, most of plat cut. It was grown on a piece of extra good ground and reached a height of 60 inches, was lodged some by storms. The heads were extra large and plump.

Manshury barley, select seed cut August 27, 1906: Seeded May 24; up June 2; July 10, heading; July 18, in bloom; August 24, first heads ripe; August 28, grain ripe; August 31, harvested. It grew to a uniform height of 42 inches and the heads were fine and large.

Burt Extra Early oats, selected seed: Seeded May 24; up June 5; July 9, heading; July 20, in bloom; September 5, three-fourths of plat ripe, cut, height 30 inches. This variety always ripens unevenly and it is hoped that it can be improved by seed selection.

Finnish Black oats, selected seed: Seeded May 25; up June 4; July 13, height 16 inches, heading; July 25, in bloom; August 23, first heads ripe; September 3, ripe; September 5, harvested. Grew to a uniform height of 48 inches and stood up perfectly. The best variety we have yet tried (Pl. VI, fig. 2).

GRASSES.

The following grasses were seeded June 13, 1906, and they made a fairly good growth during the season. They have come through the winter with the following results:

Kentucky blue grass (*Poa pratensis*): This grass started very early; in fact, as soon as the snow was gone it began to get green. June 25 the seed stalks were 22 inches high; July 13, ready to be cut for hay, not a very heavy crop, height 28 inches; July 25, seed ripe; August 8, cut for seed.

Redtop (*Agrostis alba*): Very late in starting to grow; reached a height of 28 inches, light crop; seed ripe September 5.

English blue grass (*Festuca pratensis*): June 25, heading, 20 inches high, good amount of forage; July 10, ready to be cut for hay, height 30 inches, would make good hay crop; August 8, cut for seed.

Meadow foxtail (*Alopecurus pratensis*): Began heading June 7, when 10 inches high; June 25, height 30 inches, fair amount of leaves; July 1, ready to be cut for hay, height 36 inches; July 20, seed ripe; August 8, cut for seed. This is the earliest maturing of all the varieties under trial.

Tall meadow oat grass (*Avena elatior*): June 25, three-fourths winterkilled, some in head and 24 inches high; July 31, could be cut for hay, height 54 inches, not relished by stock for some reason.

Orchard grass (*Dactylis glomerata*): June 25, height 6 to 10 inches, not doing well. It did not head at all.

Timothy (*Phleum pratense*): June 25, heading, 10 inches high; August 26, cut for seed. This grass does not produce forage enough to make a good hay crop, but it might do better under more favorable conditions.

Awnless or smooth brome grass (*Bromus inermis*): June 25, slightly winterkilled, 22 inches high, heading; July 20, in bloom; September 3, seed ripe. This is a splendid grass for hay, would give a larger yield than any of the other varieties.

Tall meadow fescue (*Festuca elatior*): June 25, did not germinate well when seeded but apparently stood the winter perfectly, 24 inches high and heading; July 16, ready to be cut for hay, 48 inches high, not many leaves, mostly stems; August 26, cut for seed.

Meadow soft or velvet grass (*Holcus lanatus*): June 25, practically all winterkilled.

Perennial rye grass (*Lolium perenne*): June 25, half winterkilled, not doing well, 10 inches high, heading. It did not amount to anything.

VEGETABLES.

Early Rose potatoes: Planted May 29; up June 15; July 20, blooming; dug September 7 and 9. Yield about nine-fold.

Burbank potatoes: Planted May 29; up June 15; August 10, in bloom; September 7, dug. The yield was eight-fold. The seed of both varieties was grown at the station in 1906, but in both yield and size the potatoes this year are inferior to last year's crop (Pl. IV, fig. 2). They keep perfectly in the winter.

Lettuce: The following varieties were seeded at intervals in the early part

of the season and furnished an abundance of fine, crisp lettuce the entire summer: Morse, Black Seeded Simpson, Philadelphia Butter, and Immensity. Of these varieties the first two are the best.

Radish: Early Scarlet Turnip, a well known variety, was seeded at intervals and furnished a succession of crops.

Crimson Globe beet: Seeded May 28; up June 12; August 12, large enough to use. A desirable variety, of good size for table use.

Edmand Blood Turnip beet: Seeded May 28; up June 12; grows larger, coarser tops than the above, not so fine fleshed and more prone to produce seed stalks.

Early Red Flat onion: Seeded May 28; up June 15; seed germinated poorly.

New White Queen onion: Seeded May 28; up June 15; germinated well and produced onions large enough for sets.

Hollow Crown parsnip: Seeded May 28; up June 16. Grew roots of fair size.

Scarlet Horn carrot: Seeded May 28; up June 18; seed germinated well and produced roots of good size, and excellent quality.

Japanese carrot: Seeded May 28; up June 16; roots of fair size, some seed stalks.

Golden Ball turnip: Seeded May 28; up June 5; August 1, large enough for use. A medium early, yellow-skinned, yellow-fleshed variety, 3 to 6 inches in diameter, and of most excellent quality.

Petrowski turnip No. 19554, imported from Sweden: Seeded May 28; up June 5. A yellow-skinned, yellow-fleshed globed variety of medium size and of fair quality. It is not a good summer turnip, will probably be better in the winter. Not attacked by "worms."

Gratscheff turnip No. 19555, imported from Sweden: Seeded May 28; up June 5; July 27, large enough for table use. A flat, medium-sized, reddish-skinned, white-fleshed variety of rather poor quality. Roots badly eaten by "worms" on the under side.

Turnip from Iceland No. 19795: Seeded May 28; up June 5. A large sized ruta-baga of coarse quality and very solid; somewhat affected by "worms."

Purple Top American ruta-baga: Seeded May 28; up June 5. A rather small variety of good quality.

Thorburn Improved ruta-baga: Same as above, but somewhat larger and of good quality.

Early Alaska peas: Seeded May 25; up June 6; July 2, beginning to blossom; July 27, large enough to use. Yielded an abundant crop; bloomed until frost; 150 feet of row yielded 80 pounds of peas, and many partly formed pods on the vines when killed by frost. One of the best varieties for the interior of Alaska.

Prolific Early Market peas: Seeded May 28; up June 8; July 14, beginning to bloom. A little later than the Early Alaska, but otherwise equally as good.

Long Yellow Six Weeks bean: Seeded May 28; up June 8; July 19, blossoming; August 12, large enough for table use.

Davis Wax bean: Seeded May 28; up June 8; July 19, blossoming; August 13, large enough for table use, pods 5 to 6 inches long. Has done well for the past two seasons.

Stringless Green Pod bean: Seeded May 28; up June 8; July 19, blossoming; August 10, large enough to use.

Bean No. 11978: Seeded May 28; up June 8; July 25 in bloom; killed by frost September 6 while still blooming profusely, has a single straight stalk, some of which grew to a height of 36 inches. Produced some short pods with very small immature beans.



FIG. 1.—MANSHURY BARLEY, RAMPART STATION.



FIG. 2.—FINNISH BLACK OATS, RAMPART STATION.



Green Curled Scotch kale, Early Winningstadt cabbage, Early Jersey Wakefield cabbage, Early Flat Dutch cabbage, broccoli, Brussels sprouts, Extra Early Paris cauliflower, Henderson Snowball cauliflower, and Dwarf Champion tomato were started in hotbeds and transplanted June 14 and 15. A partial failure of the hotbed and consequently small plants, a somewhat unfavorable season and unsuitable ground caused these vegetables to do poorly this season. The kale was very good. Of the cabbage the Early Winningstadt did the best and produced a few small heads. The cauliflower just began to head. The tomatoes just began to bloom. They were given a trial because of numerous inquiries addressed to the station requesting seed. It is evident that they need unusually favorable conditions and special care to be a success.

NURSERY STOCK.

A small beginning has been made in growing both native and cultivated fruits. Some were set out in 1906 and some this season. The following report is made on their growth:

Red currant, native: 43 plants set out this season, most of which started but made poor growth.

Red raspberry, native: 43 plants set out, nearly all started and most of them made a good growth.

Strawberry, native: The original plants, numbering 14, were brought from Fairbanks and set out in the fall of 1905. They blossomed quite freely this year and bore a few knotty berries. About 150 plants were set out this season and they made quite a vigorous growth.

Red raspberry: 8 plants growing, some canes 36 inches high.

White currant: 5 plants alive, 6 to 10 inches growth.

Red currant: 4 plants, short stocky growth 4 to 6 inches.

Crab apple: 2 trees, just made a good start.

Yellow Siberian crab: 4 trees, above the graft the wood is dead; 8 to 12 inch sprouts from the root.

Yellow Transparent apple: 3 trees, top all dead, growing from the root.

Florence apple: 1 tree, a small shoot growing from the root, top dead.

Okabena apple: 3 trees, several shoots growing from the graft, one 22 inches long.

None of the above were given any winter protection whatever.

REPORT OF WORK AT COPPER CENTER STATION FOR 1907.

By C. W. H. HEIDEMAN, *Superintendent.*

CLIMATIC CONDITIONS.

To assist in a better understanding and appreciation of the conditions under which the experimental work at this station was conducted, the following notes compiled from daily observations recorded at the station are appended:

Without any attempt to be technical, the entire growing season can be summed up very briefly—unusually cold and unusually dry.

On April 15 the ground was still covered with a depth of 10 inches of snow, though by this time the trail was getting bare in spots. Wild fowl, the first harbingers of spring, began to arrive on April 23 and

the first purple anemone was found in bloom April 29. By May 1 the snow had entirely disappeared in the valley. Seeding began late in April and was completed somewhat earlier than the usual Alaskan spring permits.

About the usual number of slight frosts, not severe enough to materially injure the hardier grains and vegetables, but sufficiently severe to check or injure tender grains and vegetables, such as buckwheat, millet, beans, and potatoes, occurred at intervals during the growing season.

For the growing season, May, June, July, and August, the mean temperature was approximately 48° F., the mean maximum 58°, the mean minimum 38°, the maximum was 80° June 29, the minimum 20° May 16, while the greatest daily range was 42°.

The total precipitation was 3.18 inches, the greatest monthly rainfall 1.14 inches in June. Rain fell on 22 days. During the period called the growing season there were 58 clear days, 7 partly cloudy, and 58 cloudy.

History in the Copper Valley dates back to '98, and the "old-timer" pronounced the season as the coldest and driest since '98.

VEGETABLES.

The vegetables grown in the station garden this year were in general a grand success. Our success with cabbage and cauliflower was mainly due to the fact that the plants were started in a hotbed.

The necessary material for a hotbed was not available until April 20, when a crude frame was built from logs, chinked, filled with horse manure and soil in the usual manner, and covered with screens of cheap muslin cloth. Seeds were sown April 23, and by May 1 the seeds had germinated and were making a rapid growth. During the daytime on warm clear days the screens were removed, while on cold nights additional protection was given by covering with blankets, etc.

By June 1 the plants in hotbed were quite large and stocky and were transplanted to open ground. Of the plants set out 95 per cent grew and formed heads of commercial size.

KALE.

Dwarf Curled Scotch: Congressional seeds, planted open ground April 23; up May 10; made slow growth in May and June; fit for table use July 1. Made fine large heads by September, averaging 5 to 10 pounds. Transplanted hotbed plants made somewhat better showing, but for all purposes the field-grown kale was good enough.

KOHL-RABI.

Large White: Congressional seeds, planted open ground May 3; up May 23; and were ready for table use July 20; reached a fair size.

Transplanted hotbed plants made a better showing, were ready for table use July 15. All made good growth, were of good size, and very crisp and tender until the very last of the season.

During the summer kohlrabi suffered slightly from frosts that did not affect cabbage and cauliflower.

CABBAGE.

Early Jersey Wakefield: Congressional seeds, planted open ground April 23; up May 11; made slow growth during May, June, and July, but very few made heads of table size. Were heading in August and September when the hard freeze came.

Transplanted hotbed plants made a splendid showing. Earliest head ready for the table August 10; all made good heads, the largest weighing just 14 pounds. This head of cabbage at the market price could have been sold at Copper Center for \$2.80.

CAULIFLOWER.

Snowball: Commercial seeds, planted open ground April 23; up May 10; made slow growth during May, June, and July. About half of the plants were making small heads when killed by frost early in September; at this time they were making fine growth and promised a good crop.

Transplanted hotbed plants made slow growth during June, earliest heads fit for table use August 8; nearly all made good firm heads averaging 2 to 4 pounds, the largest head weighing 7 pounds. When the freeze-up came all were making good growth; had the season continued only a few weeks longer the yield would have been surprising.

Seeds of kale, cabbage, and cauliflower were planted in open ground and in hotbed on the same date. The transplanted plants were twice as large on June 1. These were watered only twice after transplanting in June. The field-grown plants received no irrigation except from rains.

PARSNIPS.

Hollow Crown: Congressional seeds, planted April 26; up May 20; made feeble growth during the summer; were making good growth in August and reached only fair table size.

Early Round: Congressional seeds, planted April 26; seed did not germinate.

PEAS.

Alaska: Congressional seeds, planted April 26; up May 17; in bloom June 20; ready for table use July 10; seeds ripened August 1. Yield was good and a success in every respect.

Alaska: Station grown seeds, planted April 26. Behavior about same as the preceding; no difference was noted; all were saved for seed, which all matured between July 28 and August 8.

Knott Excelsior: Congressional seeds, planted April 26; up May 17; in bloom June 25; ready for table use July 17. Seeds matured August 10.

CARROTS.

Half Long Stump Rooted Chantenay: Congressional seeds, planted April 23; up May 28; made slow growth until late in July; made fair crop of roots fit for table. Season was too short for a large yield.

Scarlet Horn: Congressional seeds. Seeds were old and were in the ground five weeks before germination.

BEETS.

Crimson Globe: Congressional seeds, planted May 3; up May 21; made fair growth during summer; fit for table use August 1. The season was too short for a large yield, but nearly all made good-sized roots for home use.

LETTUCE.

Black Seeded Simpson: Congressional seeds, planted April 23; up May 10; was ready for table use July 4. Plants reached a very large size, were crisp and tender until the freeze-up came in September. One head measured 48 inches in circumference.

PARSLEY.

Extra Curled: Congressional seeds, planted April 23. Seeds did not germinate.

ONIONS.

Yellow Danvers: Congressional seeds, planted April 23; up May 25; made but feeble growth during the summer; none reached commercial size; season too short.

LEEK.

Large White: Congressional seeds, planted April 23; up May 25; made feeble growth during the summer; none reached table size.

RADISH.

Early Scarlet Turnip: Congressional seeds, planted May 17; up May 28; ready for table June 17; crisp and tender.

White Strassburg: Congressional seeds, planted May 17; up May 28; fit for table use July 1; crisp and tender.

TURNIPS.

Gratscheff, No. 19555: Department seeds, planted April 23; up May 11; made fine growth. This variety when harvested was the firmest and best in texture and quality of all the varieties grown; roots averaged 2 pounds.

Petrowski, No. 19554: Department seeds, planted April 23; up May 11; fine growth. This is a fine early yellow turnip; was the only variety entirely free from the maggot, which was so destructive to the next variety. Average weight 2 pounds.

Red Top Strap-leaf: Congressional seeds, planted April 23; made good growth; badly infested with maggot; yield was quite large; average roots weighed 5 to 6 pounds. The largest specimen weighed 12 pounds.

RUTA-BAGA.

Iceland: Department seeds, planted April 23; up May 11; made good growth; roots averaged 3 pounds in weight; largest specimen weighed 7 pounds. A profitable variety to grow for winter use. Seeds of this and all varieties were sown as late as June 1. All matured and averaged nearly as large as the earliest plantings.

POTATOES.

Our potato seed was grown at the station in 1906 and was stored in an underground cache. When examined in spring it was found that frost had penetrated the cache and the potatoes badly frozen. They were brought up about May 1, sorted over and a few appeared to be uninjured by frost. The seed cut to single eye, was planted in the garden May 17 and in the field May 20. Sprouting and growth were slow and only about one-half were up June 25. Were slightly injured by frost July 4; in bloom July 28; and badly frosted August 1. The behavior of all the varieties—Extra Early Ohio, Freeman, and Garfield—was about the same. Our record of first “new potatoes” was August

10. On that date an examination was made of all varieties; the Garfield appeared the earliest. The plants all froze to the ground August 24, were dug September 10, with following results:

Freeman in garden yielded at rate of 200 bushels per acre; 85 per cent were of Alaska commercial size, 15 per cent small. The largest hill had 7 of commercial size.

Garfield yielded 210 bushels per acre, 81 per cent commercial size, 19 per cent small; largest hill had 10 fair-sized potatoes.

Extra Early Ohio yielded 260 bushels per acre, 77 per cent commercial size, 23 per cent small; largest hill 7 of commercial size.

The largest hill of any variety yielded 4 pounds of fair-sized tubers; the largest potato, Garfield, weighed 7 ounces. The Freeman was the smoothest and apparently the best matured of the three varieties.

The field plantings were injured to a greater extent by frost than those in garden. The yield was only about half and the tubers were smaller and less matured.

RAPE.

Dwarf Essex: Department seeds, planted May 1; up May 15; made good growth; slightly injured by frost July 4. A few plants were cut back in imitation of stock browsing; these threw out vigorous new growth, the plants averaging from 6 to 8 pounds of foliage. Rather susceptible to frost.

BEANS.

Navy: Commercial seeds, planted May 1; up June 1; all killed by frost in June.

Horse beans, unnamed: Department seeds, planted May 20; up June 1; made fair growth; slightly injured by frost in June; in bloom July 4; badly injured by frost July 4. No seeds matured.

Soy beans: Department seeds, planted May 20; up June 1; made good growth, but little injured by frosts in June and July. In bloom July 25; killed by frost August 24. No seeds matured.

QUINOA.

No. 18536: Department seeds, planted May 20; up May 31; made good growth; slightly injured by frost in June; fit for table use July 4; badly injured by frost July 4; all killed by frost August 1. No seeds matured.

No. 18537: Department seeds, planted May 20; up May 31; made good growth; slightly injured by frost in June; fit for table use July 4; badly injured by frost July 4; all killed by frost August 1. No seeds matured.

This plant appears to be closely related to or an improved variety of the common *Chenopodium*, or lamb's quarter, which has been scatteringly introduced throughout Alaska in baled hay from the States. Our lamb's quarter appears to be adapted to Alaskan conditions and is much used for "greens."

FIELD CROPS.

For convenience of condensation and comparison of observations on the different varieties in this report reference is made to three tracts, A, B, and C.

Tract A comprises the main area under cultivation. It is on the first bench above the Copper River. The subsoil is a coarse gravel, the top is a rather sandy or silt soil washed from the benches above, rich in humus. The land, however, is very "spotted," that is, rich in spots. When the land was cleared the brush and trees were burned and these ash piles are alternately plowed

under and then crop out on the surface. Parts of the tract have been cropped for two or more years. The land was plowed late last fall and was in fair state of cultivation. One-half of the area was fertilized by the application of 100 pounds of nitrate of soda and 50 pounds of sulphate of potassium per acre; this was harrowed in just before seeding. All experimental plats were so arranged that one-half of each was fertilized. Observations are based upon the behavior of each plat as a whole. No attempt was made to conduct a series of fertilizer tests or experiments. The idea was to obtain general results, to enrich the soil which was getting poor, and give each variety under test the same conditions.

The visible effect of the fertilizers was not very marked until along in July, when the better color, health, and vigor of the plants on the fertilized portions were plainly observed. In a rough way an estimate of the benefits of the fertilizers was obtained and with slight variation it is safe to put the increased yield at 25 per cent. This, even with the enormous cost of freighting into the interior in midwinter over two mountain ranges, proved a profitable investment.

Tract B is on a third bench above the river. The subsoil is coarse gravel and clay, and on account of its aspect is considered earlier land. Frosts that injured tender vegetables on tract A did no damage on this tract. The treatment as to fertilizers and culture was the same as tract A.

Tract C is devoted to grasses. It is very low wet land.

WHEAT.

Saskatchewan Fife: Station-grown seed, tract A, sown April 28; up May 16; made good growth during summer; in bloom July 25; a few heads matured seed August 24.

Saskatchewan Fife: Station-grown seed, tract B, sown April 27; up May 14; made good growth; in bloom July 25; a few heads matured seed August 24.

Early Riga: Station-grown seed, tract A, sown April 28; up May 16; made fair growth; in bloom July 20; all matured seed by August 20.

Early Riga: Station-grown seed, tract B, sown April 27; up May 14; made fair growth; all matured seed by August 18. A few early heads matured August 10.

Velvet Chaff: Station-grown seed, tract A, sown April 28; up May 16; made vigorous growth; in bloom July 26; only a few heads matured seed August 24.

Velvet Chaff: Station-grown seed, tract B, sown April 27; up May 14; made vigorous growth; in bloom July 25; nearly all matured seed by August 24.

Ladoga: Station-grown seed, tract A, sown April 28; up May 16; made fair growth; a few heads matured by August 24.

Ladoga: Station-grown seed, tract B, sown April 27; up May 14; made fair growth; a few heads matured by August 24.

Romanow: Seed from Baker Hot Springs, Alaska, tract A, sown April 28; up May 16; made vigorous growth; in bloom July 28. No seeds matured.

Romanow: Seed from Baker Hot Springs, Alaska, tract B, sown April 27; up May 14; made good growth; a few heads matured seeds by August 24.

Romanow: Station-grown seed, station garden. This was very immature frosted seed sown April 28; up May 16; about 60 per cent germinated; growth good; in bloom July 27; was nearly matured when killed by frost August 24. No seeds matured.

Velvet Chaff or Blue stem made the best growth, but only a few heads matured.

Early Riga made only a fair growth, but ripened uniformly and all seeds matured.

BARLEY.

Pamir No. 18922: Department seed, station garden, tract A, sown April 30; up May 15; average height, 5 inches June 1; headed out June 16; in bloom July 4; seed fully matured and harvested August 1. This variety was not injured in the least by the frosts during May, June, and July. The seeds when sown were smaller and more shriveled than any of the other varieties. The seed grown at the station was plump and heavy; earliest heads matured as early as July 24. Yielded at the rate of 66 bushels per acre.

Hanna Fall: Station-grown seed, tract A, sown April 27; up May 20; in bloom July 16; made good growth; mature and harvested August 15.

Hanna Fall: Station-grown seed, tract B, sown April 27; up May 19; in bloom July 12; ripe and harvested August 8.

Primus: Station-grown seed, tract A, sown April 27; up May 20; in bloom July 20; earliest heads matured August 20; frost of August 24 prevented ripening of the balance.

Primus: Station-grown seed, tract B, sown April 27; up May 20; in bloom July 18; nearly all matured by August 24.

Hanna: Station-grown seed, tract A, sown April 27; up May 20; in bloom July 17; ripe and harvested August 23.

Hanna: Station-grown seed, tract B, sown April 27; up May 19; in bloom July 16; all matured seed August 21.

Champion: Station-grown seed, tract A, sown April 27; up May 20; in bloom July 17; all matured August 20.

Champion: Station-grown seed, tract B, sown April 27; up May 19; in bloom July 16; all seed matured August 15.

Manshury: Station-grown seed, Tract A, sown April 27; up May 20; in bloom July 19; nearly all seed matured August 24.

Manshury: Station-grown seed, Tract B, sown April 27; up May 19; in bloom July 17; all matured August 24.

Sisolsk: Station-grown seed, Tract A, sown April 27; up May 20; in bloom July 20; nearly all seed matured August 24.

Sisolsk: Station-grown seed, Tract B, sown April 27; up May 19; in bloom July 18; nearly all seed matured August 24.

Swedish No. 19557: Department seed, Tract A, sown April 27; up May 20; in bloom July 20; nearly all seed matured August 24.

Swedish No. 19557: Department seed, Tract B, sown April 27; up May 19; in bloom July 18; all seed matured August 23.

Chevalier II: Department seed, Tract A, sown April 27; up May 20; in bloom July 20; nearly all matured seed August 24.

Chevalier II: Department seed, Tract B, sown April 27; up May 20; in bloom July 20; all seed matured August 24.

No. 10754: Department seed, Tract A, sown April 27; up May 20; in bloom July 20; nearly all seed matured August 24.

No. 10754: Department seed, Tract B, sown April 27; up May 20; in bloom July 19; all seed matured August 22.

No. 12709: Department seed, Tract A, sown April 27; up May 20; in bloom July 18; all seed matured August 23.

No. 12709: Department seed, Tract B, sown April 27; up May 19; in bloom July 17; all seed matured August 20.

Numbers 10583, 10584, 10585, 10586: Department seed, sown on Tracts A and B, sown April 27. All failed to germinate.

Pamir No. 18922, from Himalaya Mountains, was the most promising barley for future Alaska work. It is apparently not a very tall-growing variety.

Attempt was made to cross this with Champion, a strong-growing beardless variety, and seeds were obtained from this cross which will be used next season.

Champion gave most satisfactory results as to yield of straw and grain, and was next in earliness to Pamir. An estimate made from small plats showed that it yielded at the rate of 2 tons per acre of straw and grain.

OATS.

Tartar King: Station-grown seed, Tract B, sown April 28; up May 19; in bloom July 23; strong growth; a few heads matured August 24.

Burt: Station-grown seed, Tract A, sown April 30; up May 21; in bloom July 26; earliest heads matured August 18; cut for hay August 20.

Burt: Station-grown seed, Tract B, sown April 28; up May 20; in bloom July 23; nearly all matured by August 20.

Banner: Station-grown seed, Tract A, sown April 28; up May 20; in bloom July 28; only a few heads matured by August 24.

Banner: Station-grown seed, Tract B, sown April 28; up May 19; in bloom July 26; a few heads matured seed August 24.

Swedish Select: Station-grown seed, Tract A, sown April 28; up May 20; in bloom July 24; only a few heads matured August 24.

Swedish Select: Station-grown seed, Tract B, sown April 28; up May 20; in bloom July 23; a few heads matured seed August 24.

Finnish Black: Station-grown seed, Tract A, sown April 30; up May 21; in bloom July 26; earliest heads matured August 15. The entire field matured by August 20; was then cut for feed.

Finnish Black: Station-grown seed, Tract B, sown April 28; up May 19; in bloom July 23; all fully matured August 15.

No. 15857: Department seed, Tract A, sown April 30; up May 17; in bloom July 4; all matured August 15; growth rather feeble.

No. 15857: Department seed, Tract B, sown April 28; up May 16; in bloom July 2; all matured August 1. This variety made the best showing in the earlier part of the season and looked very promising. The growth was very slow, heading out when only 6 to 12 inches high. It scarcely reached a size sufficient to cut for hay.

No. 13091: Department seed, Tract A, sown April 30; up May 20; in bloom July 10; all seed matured August 22.

No. 13091: Department seed, Tract B, sown April 28; up May 17; in bloom July 8; all seed matured by August 20.

No. 10624: Department seed, Tract A, sown April 28; up May 20; in bloom July 24; only few heads matured August 24.

No. 10624: Department seed, Tract B, sown April 28; up May 20; in bloom July 23; few heads matured seed August 24.

No. 1078: Commercial seed, Tract A, sown May 1; up May 21; generally in bloom July 20; earliest heads matured August 16. The entire field was cut for hay August 18. The yield of this and all other varieties was very light, owing to cold dry growing season, and checked by repeated summer frosts; growth was very slow at all times; the color was good and plants were healthy.

BUCKWHEAT.

Silver Hull: Station-grown seed, Tract A, sown May 15; up May 25; damaged by frosts in June. All killed by frost July 4.

MILLET.

Manitoba Yellow: Department seed, Tract A, sown May 15; up June 1; made but feeble growth. All killed by frost in June.

WILD RICE.

Seeds from Minnesota, sown at various times during May and June in small lakes and ponds in the vicinity of the station. None germinated this season.

WINTER GRAINS.

Nearly $3\frac{1}{2}$ acres of the station land was sown July 21, 1906, in various plats with winter grains.

Late in April, before the snow had disappeared, careful examination was made and all varieties appeared to be in fine condition. Soon after the snow disappeared it was observed that with the exception of one plat all of the varieties lost their green color, turned brown, and shriveled up. Examination showed the roots all dead.

Kharkov No. 9125 and Kharkov No. 9129 winter wheats nearly all winterkilled. Probably a hundred plants on the 3 acres survived, but made only a feeble growth and matured no seed.

Winter rye No. 11268 nearly all winterkilled; a few scattering plants matured seed.

Amber Winter rye suffered but little from winterkilling. It began heading out June 20; in bloom July 4. The plat averaged 4 feet in height. The heads did not fill well, but matured seed as early as August 15. Seed of this and No. 11268 from selected plants also from the main crop were sown at once, and at this writing (October 15) have made a fair growth and stand and are now covered with a mantle of snow.

GRASSES.

About 11 acres of the station land are devoted to grasses introduced from the States. Seedings were made in 1903-1906. With the exception of smooth brome grass (*Bromus inermis*) and wheat grass (*Agropyron tenerum*) all have winterkilled badly and have run out.

Smooth brome grass; Tract A, seeded in 1903 and 1904, barely held its own. This species started growth with the earliest native grasses about May 5; by May 15 was several inches high and made fair pasture; growth during June and July was slow, fairly vigorous in low spots. It made but little progress during the entire season and was too thin and short to cut for hay. A portion of this plat was fertilized with a top-dressing of nitrate of soda and sulphate of potash at the rate of 200 pounds per acre. The effect of the fertilizers was quite marked in the improved color and vigor, but did not increase the yield sufficiently to make it profitable to cut for hay. It afforded a fair late pasture when our pasture of native grasses was bare.

Smooth brome grass, Tract B: The behavior of this plat was similar to Tract A. It was too thin and short to cut.

Smooth brome grass, Tract C: This tract is very low, wet ground, seeded in 1906. At no time during the season did the frost leave the ground beyond a depth of 12 to 16 inches. This as well as all of the grasses on this tract winterkilled badly.

Wheat grass (*Agropyron tenerum*), Tract A: This is the most promising of all the introduced grasses at this station. There was no sign of winterkilling; the growth was healthy and vigorous. It would have made a splendid hay crop and yielded at the rate of 3,600 pounds per acre. The entire crop was saved for seed, only a part of which matured. This species is a native and is found sparingly throughout Alaska. Perfectly matured seeds of the indigenous species were secured ten days in advance of the introduced.

Wheat grass (*A. tenerum*), Tract C: This was the only variety that made a fair growth and stand on this tract. It winterkilled only to a small extent.

No seeds matured. The native form of this and an erect form of *A. pseudo-repens* found on similar ground near by made strong, vigorous growth and matured seeds.

Timothy: Tract A nearly all winterkilled. Some of the seeds that had failed to germinate last year came up, made a feeble growth, and headed out at 3 to 4 inches; was not large enough to cut for hay.

Timothy: Tract C, all winterkilled.

The plat of timothy comprising the lawn of the station grounds, seeded on well-prepared ground in 1905, and which last year yielded at the rate of over 3 tons per acre, winterkilled badly, and this year was practically a failure.

Festuca elatior, *Holcus lanatus*, hassock grass, orchard grass, redtop, alfalfa, alsike clover, red and white clover on Tracts A and C, seeded in 1905 and 1906, all winterkilled; scarcely a plant survived.

The forage problem is probably the most important agricultural problem confronting the Alaskan of the interior. Experience of the past few years shows that grain hay can be raised with considerable profit and certainty, but the rancher can not always be sure of maturing his seed.

The introduced grasses at this station have all proved a failure. Timothy, the "old reliable" of the States, can not be depended on here.

During the past season considerable time was spent in exploring the vicinity of the station in search of native grasses that might assist in solving the hay problem. This search extended beyond timber line in the Mount Drum region.

Seeds of 46 species of grasses were collected and these will be thoroughly tested under farm conditions. At least half a dozen of the species are very promising as meeting the requirements of an ideal hay grass. A few years should demonstrate their fitness and ability to stand the test of adaptation to culture conditions, yield, and nutritive value. Of the most promising species, seeds have been collected in quantity sufficient for ample test.

INDIAN GARDENS.

An attempt was made to interest the natives in gardening (Pl. VII, fig. 1). The result was gratifying from a practical as well as experimental standpoint. In the employment of extra help at this station preference is always given to the natives. Much of the land clearing in the earlier years of the station was performed by natives, and experience at this station shows that they adapt themselves easily to the white man's ways. Vegetables constitute practically no part of their diet at any season of the year.

Early in the spring of 1907 the Indians of the vicinity were informed that land, tools, and seeds would be supplied to all that would plant and care for a garden. Five of them availed themselves of the opportunity and a piece of ground about 34 by 60 feet was assigned to each. The ground was in a good state of cultivation and was harrowed and smoothed ready for planting about May 1. Seeds of such vegetables as were most likely to give satisfactory results were planted. Each Indian planted his own garden under my supervision. Simple object lessons were introduced in each garden to illustrate the effects of fertilizers, thinning and thorough culture, and irrigation, each garden containing a row or two of some tender vegetable to illustrate the hardness of the plants, and estimates of the cost of plowing, seeds, planting, watering, hoeing, thinning, harvesting, and the food as well as the commercial value of the crop were made from time to time in lectures and personal talks.

From July 1 until September the gardens supplied them with an abundance of lettuce, greens, kale, turnips, with now and then beets, radishes, cabbage, and onions, and when the freeze-up came each harvested several bags of turnips for winter use.



FIG. 1.—INDIAN CHILDREN IN SCHOOL GARDEN, GOLOVIN.



FIG. 2.—PRODUCE FROM A SETTLER'S GARDEN, LORING.

During the season they were quite generous to their unfortunate friends who had no gardens, and supplied them with vegetables. With the exception of one hoeing, which I did for them at a time when they were all at their fish camps during the salmon season, the entire work was done by the Indians. At all times there was a generous rivalry between them and they took great pride in their gardens. All have requested seeds and a garden spot for next year, and in addition to those who had gardens this year, at least as many more have applied for seeds and space. Fortunately the station has plenty of ground, and a new supply of Congressional seeds has been received, and the experiment will be continued. A few of the natives will undertake gardens at their permanent camps. Altogether the experiment has been a success.

REPORT ON LIVE-STOCK BREEDING STATION AT KODIAK.

By M. D. SNODGRASS, *Superintendent.*

On April 28, after a six weeks' journey from the States, 19 head of Galloway cattle were landed at the town of Kodiak, on Kodiak Island. These consisted of 13 cows, 5 yearling heifers, and 1 yearling bull. Later, 3 cows, a three-year-old bull, and 2 bull calves belonging to the station were brought from Wood Island. These cattle were landed on the island last year and were kept at the mission for the season. On October 28, 6 head of cows, 1 yearling heifer, 1 yearling bull, and 3 heifer calves were brought from the experiment station at Kenai, where they had been kept for the past year. Since the arrival of the herd at Kodiak 3 bull and 7 heifer calves have been dropped, making a total of 46 head at this station at the present date.

The nature of the experiment is to determine the adaptability of the Galloway cattle to the natural conditions of Alaska and to develop a general or dual purpose cow that will meet the needs of the northwest territory, both as to meat and milk production.

The Galloway cattle were chosen because of their great constitutional vigor and hardiness, and their natural adaptability to a cold and moist climate. In selecting this herd care was taken to get the best milk strain to be found in the breed in the States. The ultimate object of this undertaking is to develop and operate an experimental dairy station at Kodiak and a breeding station near by at Calsinsky Bay where cattle can be raised at a small cost and sold to the residents of this Territory at reasonable prices. In this way it is hoped that the country can be stocked with a breed of cattle adapted to the climate.

The work done this season consists of fencing with barbed wire 300 acres of pasture land near the town of Kodiak, building a shed 12 by 30 feet (Pl. I, fig. 2), digging a well, ditching swampy land in feed lots, cutting with scythe and stacking about 8 tons of native hay, cutting poles for another cattle shed, clearing ground preparatory to breaking up for crops, and laying out and staking some 8,000 acres

of land at the head of Calsinsky Bay for a permanent breeding station. The season was rather backward and unfavorable for the growth of crops and hay, but the pasture has been good and the cattle have done well. The early part of May was cold and backward, but the latter part was more favorable and the grass grew rapidly, making good pasture by June 1. The cattle were in fair condition when grass came, except the cows from Wood Island, which were very thin. All began to gain flesh rapidly and by August 1 the young stock and cows that had not calved were fat, while the cows with calves at their side were in good condition. The first frost of the season came on September 1, but the pasture was good until about October 1. Since that time the cattle have about held their own in flesh. One snow-storm of about 5 or 6 inches fell on October 23. During this storm the cows suckling calves were fed hay. On October 31, all cows with calves at side were separated from the rest of the herd, fed at night, and allowed to range during the day. All cattle will go into the winter in good condition.

All pastures inclosed consist of hill land upon which grows native bluetop, many varieties of wild flowers, and in places a low willow. The cattle eat all the plants named seemingly without choice, and there has never been the slightest ill flavor detected in the milk.

The haymaking season was favorable, and with proper equipment plenty of hay could have been secured to winter the cattle. All the hay that was put up was with scythe and rake, and carried and stacked by hand. A few days' work with team and harrow in the early spring will put some 20 or 30 acres in condition for mowing hay with a machine. Much of the best hay land near the station has been taken up by the people of Kodiak.

The conditions at Calsinsky Bay are more favorable for haymaking, and an ideal stock farm can be made there.

On the whole the prospect is very bright for the successful operation of a dairy and breeding station.

WORK AT THE C. H. FRYE RANCH, KODIAK.

Progress at the C. H. Frye ranch has been the most successful this year of any year since the work began. Efforts have been devoted to stock raising, improving the farm, and clearing and breaking more land upon which the hay crop is to be mown each year. Much of the hay land must be worked over with a harrow and drag to tear up the moss and level the land so that a mower can be run over the ground; there are many little tufts of grass grown up with moss that make the land very rough and almost impossible to cut hay with a machine.

There are about 50 acres of land now in tame grass, most of which is sown in timothy. The crop was light this year, as the season was short and cool. Timothy has been grown here successfully in former years when manure had been spread upon the land.

The principal feed to be depended upon for winter is the beach grass (*Elymus mollis*) for silage and the native bluetop for hay. Plenty of both kinds of grass grows on the ranch. Five hundred tons of silage and 80 tons of hay were put up this season for the winter feed.

The silage was put up at a cost of about \$1 per ton, while the hay was more expensive to put up. The uncertain weather makes it necessary to cock and often scatter and recock the hay in order to cure it. This year, however, the haymaking season was more favorable than usual.

There are now 178 head of cattle on the ranch. Twenty-five of these are grown steers, which will be marketed next summer. Thirty-five calves were raised this year, and all are growing well. Three bulls are kept for breeding purposes. The cattle fattened by mid-summer and have held their flesh well. The range consists of low-lying hill and beach land, which affords splendid pasture of native grasses.

The sheep, of which there are 124 head, are perhaps the best paying investment on the ranch. They require very little attention and but little feed the whole year round. The flock was fed but a few days during the past winter and all came through in splendid condition. The breeding flock increased over 100 per cent the past season. Lambs make good growth and are hardy and strong.

The horses kept on the ranch number 9 head at present—2 stallions and 7 mares. These are bred for spring colts. It is the intention of Mr. Rier, the superintendent, to raise horses in the future and make the ranch an all-round stock farm.

DAIRY PRACTICE AT KENAI STATION.

By P. H. Ross, B. S.

The following account gives in considerable detail descriptions of actual dairy practice as followed at the Kenai Station and describes the necessary implements and apparatus required for modern dairying. It is believed that the suggestions offered will be found applicable to Alaskan conditions generally wherever farm dairying is contemplated.^a

The beginning of a dairy herd was made at this station by the purchase of a cow and a calf June 3, 1902. This cow was bought from the Russian priest at this place and had originally come from Kodiak. She proved a good milker for a native cow, yielding a daily average of 29 pounds the first three months after calving, and milked continuously until August of the next year. In this instance the conditions were unusually favorable, as the cow came fresh in June, with the grass at its best. She has never equaled her first year's record, as after the first time she calved in the winter. She holds the station record for quality and quantity of milk.

Two more cows, daughters of the first cow purchased, were bought in 1903, one in August and the other in October. They calved the following spring and proved to be good milkers for a short time, but lacking in persistency.

On May 13, 1906, the station received a shipment of 7 Galloways—5 cows, a heifer calf, and a bull. These cattle were purchased in Missouri, and in buying the cows preference was given those possessing dairy qualities. They are a very hardy breed, and it is hoped that their dairy qualities may be improved without any sacrifice of hardiness. All the cows have calved this winter.

CARE OF COWS.

In summer the cows are turned loose to range at will. Each evening they are driven to the stable to be milked and are kept in the lot at night, milked at 6 in the morning and again turned loose. During the greater part of the summer, when good grazing and water are near at hand, this arrangement is satisfactory, as the cows are always

^a Some of the methods and processes are more fully described in U. S. Dept. Agr., Farmers' Buls. 63, 201, and 241, which may be obtained by application to the Secretary of Agriculture, Washington, D. C.

to be found at no great distance. But after the first frosts come they begin to stray, and it is sometimes impossible to locate them in the evening, although two of the cows carry bells. Missing a milking tends to decrease the milk yield. During the winter the cows are stabled and fed twice daily. They are turned out every morning to be watered and remain out while the stables are being cleaned. If the weather is fine they remain out all day, which in the depth of winter is of five hours' duration. During the shortest days they will drink but once a day, but require water twice a day when the days grow longer.

The plants that form the major portion of their ration in the summer are the bluetop, June grass, bunch grass, and wild pea. They seem to prefer the latter above all the others, and its value as a milk producer is above question.

In winter their feed consists almost wholly of oat hay. This plant is chosen for its quick growth, comparatively heavy yield, and its excellent feeding qualities. Since being supplied with haymaking machinery we have been successful in putting the hay up in excellent condition, and it has remained bright and clean when stored away in the hay sheds. The oats are cut while in the milk stage, at which time they are best for hay. Oat hay is a palatable feed, greedily eaten by all stock, and is neither constipating nor unduly laxative. It is not a perfectly balanced ration, and of course lacks in succulence, but as a single feed it surpasses any other produced in this latitude.

The bull is fed exactly the same as the cows and cared for in the same manner. He is allowed to run at large during the summer and has never given any trouble. This arrangement is unsatisfactory, inasmuch as the date of breeding of any of the cows can not always be ascertained; but considering the amount of labor required to care for the bull in case he should be confined and the extra feed required it is the best arrangement that can be made. The present head of the herd is a pure-bred Galloway, Henry of Lockside, 23525.

CARE OF COWS AT CALVING TIME.

As the time of parturition approaches, the cow is kept up to prevent any possibility of her straying away and calving outside. Not only is there danger of freezing, but of all domestic animals the cow is peculiarly liable to have trouble in giving birth to young and should be closely watched at such time in order to give assistance when necessary. If the cow is in good condition and it is possible to give her a box-stall to herself she will in the majority of cases require no assistance. We have been fortunate at this station, as there has not been a single case of difficult parturition to date.

Retention of the afterbirth is likely to give trouble, especially if the cow has been poorly fed. The most effective means used here to cause the expulsion of a retained afterbirth is to give the cow all the warm water she will drink and as warm as she will drink it shortly after calving. Every muscle in the cow's body is "drawn up in a knot" from pain and perhaps from cold, and the warm water seems to have the effect of relieving the tension and the afterbirth is usually expelled within a half hour. If it is longer delayed the warm water treatment is continued. Nothing could be more detrimental at such time than to allow the cow to fill up on ice-cold water. Sometimes all other measures fail and the afterbirth must be removed by hand. If allowed to remain and decompose, not only will the quantity of the milk be reduced for the whole milking period, but the cow will suffer in health. In some cases a decomposing afterbirth causes blood poisoning and death.

In two instances at this station the afterbirth was retained, necessitating its removal by hand. The method used was as follows: Such clothes were put on as could be discarded when soiled. The right arm, bared to the shoulder, was well oiled or soaped and the left hand treated in the same way. The protruding portion of the afterbirth was grasped by the left hand and the right introduced into the womb. A slight pulling, twisting motion with the left hand will enable the operator to follow the afterbirth to its fastenings on the wall of the womb. It is fastened to small button-like protuberances and must be removed from such one at a time. Of course the cow must be made fast, so that she can not move about. The operation is not difficult and does not require a great length of time, but when necessary its proper performance is of prime importance. It should be performed within 48 hours of birth, before the passages contract to normal size.

THE CALF.

The calf is allowed to remain with its mother for 2 or 3 days or until it has strength to move about easily. A cow understands the care of a new-born calf better than a man does, and a calf will get a better start if left to its mother at first than it would if removed at birth. If the cow secretes more milk than the calf will take, this is drawn at regular intervals. When the calf has gained sufficient strength it is removed from its mother and taught to drink milk. At its first lesson it is allowed to suck the fingers, which have been dipped in warm milk. Its nose is then gradually drawn into the milk pail, and if allowed to retain the fingers it will make out its meal as easily as if sucking the cow. It soon learns to associate its food with the milk pail, and after it has done so it will usually learn to drink of its

own accord. If not, a great deal of patience will be required of the feeder. Some calves will learn to drink at the first feed, while others will remain obdurate as long as two weeks.

The feed for the first two weeks is whole milk, 12 to 14 pounds per day in two feeds. At the end of that time some skim milk is added and the proportion gradually increased until skim milk comprises the whole diet. In the case of the Galloway calves this winter, as the supply of milk was deficient and it was especially desired that the calves be kept in the best of condition, they have been fed partly on whole milk throughout the entire milk-feeding period. At the age of four months the calf can live and thrive without milk, but in winter time if skim milk be abundant they are fed it till grass comes. In the summer, however, they seem to thrive as well after having reached this age without the skim milk as with it.

DAIRY EQUIPMENT.

The first dairy utensils used by the station were homemade. An 8-gallon keg with a lid and dasher served as a churn. The butter was worked in a wooden bowl with a paddle. For making small amounts of butter this equipment answers very well and is recommended to Alaska farmers who make butter for household use only and have not the means to purchase a more expensive outfit.

In the fall of 1905 a more elaborate outfit was received, consisting of a barrel churn, a butter-worker, a Babcock tester, and a supply of glassware and sulphuric acid. A small hand separator was added the following spring.

The churn (figure 1).—The churn is of the barrel type, with a capacity of 15 gallons. It is mounted upon a frame and in the process of butter making is revolved by means of a crank. This style of churn is the best of those run by hand power. With it butter can be made as quickly and as easily as with any other, and it has the added advantage of having no corners—lodging places for dirt and bacteria—which renders cleaning easier than in other types. Of course, any style churn can be made scrupulously clean if enough pains are taken, but the simpler the operation the more likely it is to be performed thoroughly.



FIG. 1.—Barrel churn.

The butter-worker (figure 2).—The worker is a V-shaped bed supported on three hinged legs; the leg at the apex being shorter than the other two, gives the bed a slope. At the apex of the worker is a casting into which is fitted a wooden lever which extends the whole length of the worker. This lever is operated by hand to bring the butter into a solid mass suitable for consumption and to incorporate the salt. The slope of the body of the worker carries away the water and buttermilk that are expelled from the butter in working. Any amount up to 15 pounds can be conveniently handled. The worker is very satisfactory on account of its simplicity. All parts that come in contact with the butter are of smooth, hard wood which is easily cleaned. When not in use the legs may be folded up

against the body and the worker set out of the way.

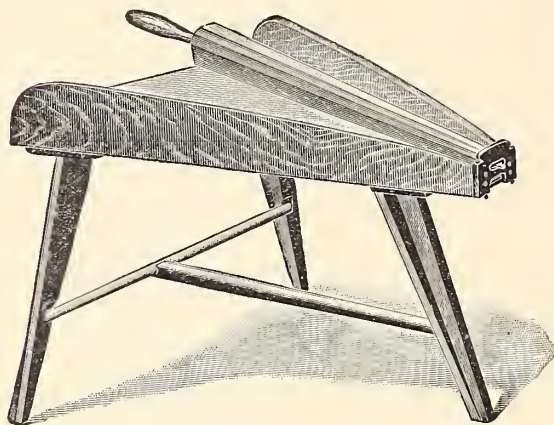


FIG. 2.—Butter-worker.

The cream separator.—This machine is too expensive for the use of those who have but two or three cows. When the herd consists of as many as eight cows, the machine will pay for itself in a comparatively short time in the amount of cream saved by its

use. It is only used to extract the cream from the milk. The dairyman who sells his milk will have no use for it.

The separator used here has a capacity of 450 pounds per hour. It does very efficient work, under favorable conditions leaving less than 0.05 of 1 per cent of fat in the skim milk.

An explanation of the principle of cream separation may not be amiss here. The separation of cream from milk by any process depends upon the difference in specific gravity between the fat and the other constituents of milk. In natural cream separation, where the milk is placed in pans, gravity acts as the separating force, and the cream, being the lightest part of the milk, rises to the top. In machine separation centrifugal force is the separating agent. A steel bowl is made to revolve many thousand times per minute, setting up centrifugal force within it. In passing through the bowl the heavier part of the milk is forced to the outside and the cream collects in the center. An outlet near the edge is provided for the skim milk and the cream

outlet opens from the center. Centrifugal force in one of these machines being so much greater than the force of gravity in natural cream separation, the separation takes place in much less time and is much more complete.

The Babcock tester.—The testing apparatus used here consists of a tester, milk bottles, cream bottles, skim-milk bottles, acid measure, pipettes, and a supply of sulphuric acid.

The tester is a horizontal wheel run by hand power. Around the outer edge of this wheel are suspended swinging pockets of tin, in which the milk bottles are set in testing. When the wheel is revolved the bottles assume a horizontal position. This wheel is inclosed in a galvanized-iron frame fitted with a tin cover.

The milk bottle is a small bottle that will hold about 1½ ounces and has a long, slender neck. This neck is graduated from 0 to 10 per cent, each division of which reads 1 per cent. Each large division is still further divided into five subdivisions, each of which reads 0.2 per cent. The neck of the bottle holds 2 cubic centimeters of water, 2 grams. The amount of melted butter necessary to fill this space would weigh 1.8 grams, which is exactly 10 per cent of the amount of milk used in testing.

The cream bottles are graduated from 0 to 30 per cent. Owing to the variable consistency of cream, caused by the incorporation of air and the different percentages of fat in the different creams, an accurate sample of cream can not be taken by measure. The cream should be weighed by means of cream scales.

The skim-milk bottle has two necks, one to admit the milk and the other graduated to show fat percentages. The whole scale amounts to but one-half of 1 per cent and has ten subdivisions. Each subdivision reads 0.05 of 1 per cent.

The pipette is used in measuring milk for testing it. It is marked to indicate the amount of milk to be taken for a test; i. e., 17.6 cubic centimeters. About one-tenth of a cubic centimeter will adhere to the sides of the pipette, delivering into the bottle 17.5 cubic centimeters, which is the amount of milk required to make 18 grams in weight.

For measuring the acid we have a 2-quart bottle with the measure attached. By tipping the bottle this measure is filled and a stop-cock empties it into the milk bottle. It is much safer and more convenient than a separate acid measure.

The acid used in milk testing is ordinary commercial sulphuric acid, but it must be of a certain density—1.82 specific gravity. The station is supplied with a large carboy of this material. It is kept stoppered with a glass stopper to prevent its weakening by the action of the atmosphere. Care must be taken that it does not come in contact with the person or clothing in handling.

Cheese-making apparatus (figure 3).—The vat is made of tin and is 30 inches long, 15 inches deep, and 16 inches wide. Beneath the vat proper and contiguous with it is a jacket 1 inch in depth to be filled with water, which prevents sudden variations in the temperature of the contents of the vat. It is fitted with a set of detachable legs, which can be folded together and placed within the vat when not in use.

A small two-burner coal-oil stove belongs to the outfit. It is very convenient and gives sufficient heat for the purpose.

An upright automatic spring cheese press is used. It is of a size and power to make a cheese up to 10 pounds in weight.

The cheese knife has a gang of blades that makes a vertical cut. The curd stirrer is a wooden instrument in the shape of a T-square.

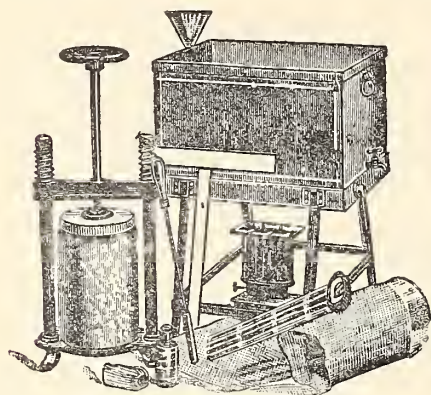


FIG. 3.—Cheese-making apparatus.

DAIRY PRACTICE.

The dairy work for the most part has been confined to the summer months. We have no separate building in which to carry on the work, and the superintendent's quarters are not spacious enough to allow of installing the dairy machinery

in the house. A shed on the north side of the house has been fitted up for the purpose and answers very well in the summer. During the winter all the dairy work that is done is carried on in the house, except the separating, which is done in the shed mentioned. In operating the separator all parts that come in contact with the milk were warmed at the kitchen range just before using. This is necessary for the best results in cold weather.

During the summer the cows having free range have ideal conditions as far as cleanliness is concerned. If by any chance the udders are soiled at milking time they are, of course, washed off, and in the handling of milk or in the manufacture of its products our ideal is scrupulous cleanliness.

Separating.—Immediately after the milk is drawn it is run through the separator, being in just the right condition at this time for best results. If the milk becomes cold the process will be much more difficult, and if it becomes cold and is warmed too suddenly a large percentage of fat is lost in the skim milk. In short, milk is in the best possible condition for separating while it still retains the animal heat

In pouring the milk into the supply can of the separator it is run through a wire strainer to remove any particles it might contain that would clog the openings of the bowl. The separator is then started, but the milk is not allowed to run into the bowl until full speed has been attained. The machine will not do good work unless running at the proper speed. Directions as to operation accompany all separators, and following these directions carefully will usually give the best results. The proper number of revolutions is always given, and it is best for the operator to time himself by the watch until he learns by practice the proper speed. The force should be applied to the crank uniformly during its revolution and not in jerks. When the supply can is nearly empty a quart or two of tepid water is added to carry out the cream that would otherwise be left in the bowl.

The skim milk is immediately fed to the calves, as it is in a better condition to feed at this time than if allowed to grow cold. The foam that always collects on the surface of milk coming from a separator is not fed, as it is believed that it causes bloating and scours.

All parts of the separator that come in contact with the milk are of tin, except the bowl, which is steel, and all are detachable. As soon as practicable after separating they are taken apart to be washed. The advantage of washing immediately is that the milk on the surfaces of the different parts is still in liquid form and easily removed, while if allowed to stand for a while it becomes hard and dry and its removal is much more difficult. The separator is washed according to the general rules of washing all dairy utensils, which are as follows: Tepid water is used first to rinse out all milk and foam remaining. Hot water should not be used for the first rinsing, as it will cook the milk to the surface of the tinware and instead of aiding in the cleansing process will make it more difficult.

The next step is to thoroughly wash the tinware with water as warm as the hand can bear, in which an alkali washing powder has been dissolved. Brushes are furnished with the separator for cleaning its various parts, and are used because they are more cleanly than a cloth, which will leave bits of cloth and lint on the tinware.

The final step in washing is to thoroughly scald all parts with boiling water, which removes all traces of the alkali and leaves the tinware bright and clean. A clean towel is used to remove any moisture that may remain on the surface, to prevent rust.

If the tinware is free from cracks, crevices, and acute angles, as it should be, and has been washed in the manner described above, no trouble will be experienced in keeping the cream sweet as far as the cleanliness of the separator is concerned. The matter of temperature has a greater influence on the keeping qualities of milk and its products, however, than cleanliness. Some agents advocate that their

machines need cleaning but once a day (two separations). A glance at the inside of a bowl at the end of one operation will convince almost anyone that an immediate cleaning is necessary.

Care of cream.—The cream is kept in an earthen jar in a room with an average temperature of 60° F., which is an ideal temperature for ripening cream. The room in which the cream is kept is on the shaded side of the station building, and in the summer the temperature of 60° is approximately maintained naturally. The cream of each skimming is cooled before being added to the cream previously skimmed. The churning is done once a week, and when the cream has stood that length of time it is about the right stage of ripeness. As each new skimming of cream is added, the whole is well stirred to allow it to attain a uniform ripeness or acidity, which gives the delicious flavor so much relished in fresh butter. The two skimmings just preceding any churning are not included in that churning, but are kept until the following week.

Churning.—On churning day the churn and all utensils that are to be used in the making of butter are rinsed out with hot water to remove any particles of dust that may have collected since the last churning. They are then rinsed with cold water, in which condition they are used, as this prevents the butter from sticking to them. In the winter artificial coloring at the rate of 1 ounce of color to 100 pounds of butter is used. The small amount of coloring required is harmless and adds much to the attractiveness of the butter. When the cows are on grass the butter is of course naturally colored.

The churn should be one-third full, which will give butter in less time than more or less than this amount. It is turned at a speed just short of that which would set up centrifugal force. The butter usually comes in less than one-quarter of an hour. When the butter granules have attained the size of grains of wheat the buttermilk is drawn off. If churned longer than this the removal of the buttermilk becomes difficult. When the buttermilk has drained off, water equal in quantity to the amount of buttermilk, and of the same temperature or a few degrees lower, is added. The churn is swung gently back and forth for a few times and then allowed to stand for twenty minutes to permit the water to absorb the buttermilk that still remains on the butter. It is drawn off and an equal quantity of water again placed in the churn and allowed to stand for the same length of time. This water should run away clear, but if not, the washing is continued until it does.

The butter is now placed on the worker. The object of working the butter is to form it into a solid mass and to incorporate the salt, which is added in the proportion of 1 ounce of salt to the pound of butter. After the salt has been added it is set away for half an hour for the salt to dissolve. It is then reworked and the working should

cease at the point when the salt is evenly distributed. Unequal distribution of the salt causes white streaks or mottles in the butter. Just the right amount of working can be determined only by experience.

The next step is to form the butter into 1-pound prints by the use of a paddle and wooden mold. The prints are wrapped in parchment paper and set away in a cool place. The utensils used are given a thorough washing and scalding, and the operation is complete.

Cheese making.—Preparatory to making a cheese the vessels to be used are given the usual scalding. The evening's and morning's milk are used to make one cheese. After being mixed the milk is allowed to stand for two or three hours in order that it may become of uniform ripeness; then the water chamber is filled with hot water and the oil stove lighted and placed underneath the vat to raise the temperature of the milk to 82° F. At this temperature the cheese color and rennet tablets are added, in the order named. One teaspoonful of the color is used to each 8 gallons of milk, which is then well stirred to evenly distribute the color. The rennet tablets that have previously been dissolved in cold water are then added in the proportion of 1 tablet to each 8 gallons of milk, and the milk is again stirred. The contents of the vat are allowed to come to rest and are not again disturbed until coagulation takes place, which will be in from 30 to 40 minutes. A good method for testing the curd is to plunge the finger into the curd vertically and then changing it to the horizontal draw it to the surface. If the curd breaks clean across the finger it is in the desired condition for cutting.

The knife used has a gang of six blades placed at intervals of three-fourths of an inch. It cuts vertically, and the strokes are made cross-wise and lengthwise of the vat; and at the beginning and end of each cut the knife is brought to the extreme edge, to avoid leaving these portions uncut, as a careless stroke would do.

The curd stirrer is next used to further break up the curd. This process is carried on very gently at first to avoid undue loss of fat, but as the curd becomes firmer more force may be applied. The stove is again brought into use and stirring is kept up to keep the curd from matting together until its temperature reaches 98°, when the contents of the vat are again allowed to come to a rest. The temperature of 98° is maintained to better facilitate the formation of lactic acid. The flavor of the cheese depends in a great measure on the length to which this development of lactic acid is allowed to go. To test its acidity a heated iron is used. A piece of curd is squeezed in the hand to expel as much whey as possible and is then pressed against the hot iron for a few seconds. When drawn away fine threads will be drawn out, and the longer these threads are the stronger the flavor of the cheese will be. A cheese of mild flavor,

desirable for home consumption, is indicated when the threads are one-half inch in length.

When the desired amount of acid has developed the whey is drawn off, one end of the vat is raised, the curd piled in that end and allowed to drain. Salt checks the development of lactic acid and also adds much to the flavor of the cheese. It is added in the proportion of 1 ounce of salt to every 3 pounds of curd. Both the salt and the curd should be weighed, as too small an amount of salt will injure the flavor, while too much will make the cheese dry and hard. The salt is worked through the curd with the hands, and when sufficiently mixed the curd is spread out to bring the temperature down to about 78°. At this temperature it will unite under pressure in a smooth, solid mass with a minimum loss of fat. If pressed at a high temperature the fat, being in a liquid state, is more likely to be pressed out.

The cheese bandage is drawn over a tin cylinder provided for the purpose and this cylinder placed within the galvanized-iron hoop. The curd is filled in and the tin cylinder removed, leaving the curd within the bandage. The hoop is placed within the press and pressure applied moderately. When the cheese has been in the press one hour it is removed, the bandage straightened, circular pieces of cheese cloth placed at each end and again put into the press and full pressure applied. By means of springs the pressure is made continuous, so as to take up the slack automatically. The cheese remains in the press for about 20 hours, is then taken out, and the sides and ends are rubbed well with salt and the cheese put away on a shelf to cure. For the first week the cheese is turned daily and the ends rubbed with salt. After that it is turned two or three times a week. The temperature of the curing room should be fairly constant, a temperature of 60° giving good results. In from four to six weeks the cheese will be ripe.

The use of the Babcock test.—Once each week a sample of each cow's milk is taken and tested for butter-fat content. The method of taking the sample and of making the test is as follows: All the milk of a single milking of each cow is taken while fresh and poured from one pail to another half a dozen times to mix the milk, as even in freshly drawn milk the greater portion of the fat will be found near the surface. Then with a pipette a sample is immediately taken from near the center of the column of milk and transferred to the milk bottle. An equal amount of sulphuric acid is added and the bottle grasped by the neck and given a twirling motion until its contents are well mixed. The action of the acid is to destroy all other parts of the milk except the fat, which it does not affect. When the acid has been added to all the samples and the contents of the same are well mixed they are placed in the tester and whirled. During this whirling the bottles assume a horizontal position, and centrifugal force acting on the con-

tents forces the lighter part, the fat, to the inside, which is the top of the bottle. When the bottles have been whirled for five minutes enough hot water is added to bring the fat well up into the necks. The water should be about 140° in temperature. The bottles are whirled again for one minute and are then read. A pair of dividers are placed on the neck of the bottle with the points exactly at the extremities of the fat column. The lower point is placed on 0 and the upper point will give the correct reading of the fat percentage.

NATURAL ADVANTAGES FOR DAIRYING.

The vicinity of Cook Inlet is unusually well supplied with good water. Small springs and streams are abundant. Well water is found at a depth of 28 feet. A dug well at the station has furnished practically an unlimited supply of water for years. The demand on the well comes in the winter, the stock in the summer being abundantly supplied from the near-by streams.

The well water is soft, seemingly devoid of all mineral matter, and its 25-foot covering of sand is an excellent preventive of organic impurities. The temperature of the water varies about 2° during the year—from 32° to 34° . Ice formed on the walls of the well in winter hardly thaws out before cold weather returns again. The advantages to the dairyman of an unlimited supply of ice-cold water during the summer months are too obvious to mention.

Another advantage is the total absence of any plant detrimental to the health of stock or causing any undesirable flavor in the milk. True, the poison parsnip is found in the swampy land of this region, but the station has lost no cows during the seven years of its existence whose death was due to eating this plant. Some years ago a cow owned by one of the residents of this place died suddenly and her death was attributed to this plant, but there is no evidence that she ate it except the fact that she died suddenly. Stock will not eat this plant unless forced to by hunger when other feed of a succulent nature is scarce. In this region the grass springs up immediately after the snow goes in the spring, and having plenty of it the stock will naturally avoid less palatable forage.

The absence of bad flavors from the milk at all times is of great importance to the dairy industry. This refers not only to the freshly drawn milk, but also to that which has been kept standing for several days, which undergoes no change except that of lactic-acid fermentation (formation of clabber milk). This acidity is desirable, as was shown under the discussion of the care of cream. During the whole time of the station's work not a single instance of bitter milk, stringy milk, bloody milk, or gassy milk, which frequently causes trouble to dairymen in the States, has been noted. These results, no doubt, are due to the practical absence of undesirable forms of bacteria, owing to the relative low temperature of our summers.

REPORTS FROM SEED DISTRIBUTION.

Persons who seek information about Alaska are recommended to read the letters published herewith. They are in a way more valuable than reports from the experiment stations, in that they record the things the people accomplish. These are only a part of the letters received on that subject. All that reach the station are not written in the same sanguine mood which characterizes most of these. Taken as a whole, the season was not favorable and many report failure, though most of the following letters report splendid successes. Then, again, the reader is recommended to study them because of the practical directions found in many. To garden successfully in Alaska requires experience, whether one gets it for himself or utilizes the experience of others. The latter plan may often save time and labor, to say nothing of disappointments. For this reason it is highly desirable that reports telling what has been done should also contain clear and concise statements of how it was done. Many reports are lacking in this particular. But they all show the possibilities of the country. From the southernmost boundary to far north of the Arctic Circle these reports tell what Alaska can produce under ordinary pioneer conditions, with very meager facilities. Seeds and labor are the two all-important factors. The men and women who are subduing the Alaskan wilderness need not be exhorted to labor; they do their share of the world's work nobly, and the garden seed will be furnished them by the experiment stations on application. The Bureau of Plant Industry of the U. S. Department of Agriculture has kindly furnished seeds to the stations for this purpose.

Fred Patching, Fortman Salmon Hatchery, Loring, Alaska, November 14, 1907.—The season was probably two weeks later than usual, but after the good weather came it made up for lost time. Burbank potatoes did well. On one piece of ground which was 88 by 52 feet we dug 2,846 pounds. Gold Coin potatoes from 4 pounds of seed harvested 81 pounds. White Mammoth potatoes from 4 pounds of seed harvested 46 pounds. Banner potatoes from 4 pounds of seed harvested 47 pounds. Early Ohio potatoes from 12 pounds of seed harvested 216 pounds. Extra Early Ohio potatoes from 4 pounds of seed harvested 11 pounds. Some kind of a disease attacked the Extra Early Ohio potatoes, which accounts for the small yield. String beans, the Early Mohawk, did well and were good yielders, but toward the last were badly attacked with rust. The beans were of good flavor. Beets, Dewings Blood Turnip beets, did extremely well, growing large and were of fine flavor. Giant Feeding sugar beets grew well, but did not grow very large. Cabbage, the Early Jersey Wakefield, did well and every plant made a hard head and was

ready to use by August 1. All Seasons cabbage is fine, but a little late. Late Flat Dutch cabbage did fine and made a large growth, some weighing as high as 21 pounds, solid heads. Some of the outside leaves were enormous, being as much as $9\frac{1}{2}$ feet in circumference and $38\frac{1}{2}$ inches across (Pl. VII, fig. 2). Carrots, Earliest Short Horn, did very well and came in early. Early Scarlet Horn and Danvers carrot both did well. The Improved Short White carrot yielded a very large crop. Cauliflower, Early Favorite, could not be beaten in any country, being large, crisp, and of fine flavor. Celery, Golden Yellow Self-blanching, did not do well. Cutting, or Soup, did fairly well. Celeriac, Large Smooth Prague, did not do well. Lettuce, White Summer Cabbage, did well. The Early White Self-folding lettuce was, I think, the finest I ever saw. Mushrooms did not do well. Onions, White Portugal, and parsnips, White Dutch, did well. Peas, Earliest of All, or Alaska, made good growth and yielded enormously. The American Wonder pea did very well, but did not yield so well as the former. Radishes, Scarlet Turnip and French Breakfast, did very well, and so did spinach, Improved Thick Leaved. Turnips, Extra Early White Milan, did extremely well and yielded enormously. Rutabaga, American Purple-top, did very well and grew to a large size; one measured 36 inches in circumference and weighed 21 pounds without top; another measured $38\frac{1}{2}$ inches in circumference and weighed $19\frac{1}{2}$ pounds. The Perfection White rutabaga did well. Parsley, Champion Moss Curled, did fairly well. Rhubarb did extremely well, some of the stalks being over 2 feet long. Horse-radish did not do well. Strawberries did not do well; had lots of blossoms, but very few berries were formed.

The trees which you sent us did as follows: 1 Darrt apple grew 20 inches; 3 Early Strawberry apple grew from 20 to 28 inches; 3 Whitney crab apple grew from 18 to 28 inches; 3 Wealthy apple grew from 4 to 16 inches; 6 Seedling apple grew from 8 to 19 inches; 2 cherry trees died; 3 plum trees grew from 5 to $21\frac{1}{2}$ inches; 3 basket willow grew 24 inches. These measurements are all for the new wood grown.

S. Stride, Haines, Alaska, November 20, 1907.—Thanks for trees and bushes sent last spring. All are alive, but the growth was not much on the apples, about 12 inches. The apple trees of 1906 did much better this year, growing 26 inches. The raspberries grew 4 feet canes, but one-half of the fruit did not ripen before frost came and destroyed it. I think if you can get a cross between the salmon berry and raspberry it will ripen here all right. My currants bore fruit and are doing well. I sent to British Columbia last spring for Dewberry bushes, but they were too long coming and died. Shall try again. My potatoes, rhubarb, carrots, and turnips did well.

Andrew Jackson, Keeper Point Sherman Light station, Lynn Canal, Alaska, November 10, 1907.—The choice selection of garden seeds and the nursery stock which you kindly sent this station were duly received in excellent condition, and were planted. The apple trees made a growth of 10 to 20 inches in the season. The plum tree withered, but the balance of the trees are doing nicely. Red currants made an average growth of about 10 inches, with some fruit; the plants look well and strong. White currants took root and are doing well, but no fruit. Raspberries are doing nicely. The mint looks fine and horse-radish is doing nicely. The basket willows are growing slowly. The greater number of the hardy vegetables have done fairly well and I have found the seeds of good quality. The flower seeds did not germinate, although planted in boxes and kept in a good warm place. My greatest success has been with potatoes, and I was informed by Mr. P. J. Werlich, light-house inspector, that I had the largest potato tops that he had ever seen in Alaska. Some of these potato tops measured over 5 feet in height, so there is some reason to believe that his state-

ment is well founded. Some of the potato hills contained from 20 to 40 potatoes, weighing from 6 to 8 pounds to the hill. The largest potato weighed $1\frac{1}{2}$ pounds. The potatoes from 20 hills would more than fill a sack, and those from 3 to 4 hills would fill a good-sized water pail. But all my potatoes were not like this, for some were small and not of good shape. This was where the ground had not received the proper amount of the right kind of fertilizer. Where no fertilizer was used the potatoes were no better than last year, although this was a more favorable summer than last year. This proves that the condition of the soil is of more importance than the weather. It will be a cold summer, indeed, when potatoes fail to grow in Lynn Canal, provided the soil is in proper condition. I succeeded in getting a fairly good stand of orchard grass, also white clover, which is still green and growing at this late date. The apple trees received in the spring of 1906 were almost destroyed by the snow last winter, which stripped off all of the branches. The raspberries made a growth of new stalks from 30 to 50 inches, but there were only a few berries this summer. Red and white currants are growing slowly and are in good condition, but there is no fruit this year.

C. E. Peterson, Sentinel Island Light station, Alaska, October 26, 1907.—Our garden has done very well this last summer, considering the very wet season. We seeded cabbage, celery, cauliflower, and rhubarb indoors in boxes in early part of spring and transplanted to cold frames May 20. Transplanted to open ground June 15. I only planted Early Wakefield and Winnigstadt this year, both doing equally well. Cauliflower did not do well this year, and cabbage was late in heading and small but good and crisp. My celery did not bleach until late, probably on account of the unusually cold weather this fall. My root vegetables did well this year. Ruta-bagas were large and good. Beets and parsnips did not do well. Peas did splendidly this year in ground that had never been turned until this last spring and hardly any fertilizer. I seeded Nott Excelsior and Alaska; the latter gave the best results and very large peas and sweet. Our potatoes did better this year than any previous year since we started gardening. I planted some I had from Thomas Knudson's ranch, a large, flat potato, one of which weighed 18 ounces. My neighbor, Mr. C. Bohm, planted some potato eyes he had received from the East and they did remarkably well. We planted tomatoes; they grew large bushes, blossomed, but died out. Cucumbers did not do well. The apple seedlings you sent I set out and they grew from 15 to 26 inches. In new ground all the berry seedlings bore fruit; the red currant especially did very well. The trees I have had for two years did not grow anything to speak of this year, but the last you sent started to grow as soon as I planted them and carried large leaves. Maggots destroyed the horseradish. Willows growing slowly. Our rhubarb did very well the second year's growth.

T. H. Jarmy, Comet, Alaska, October 1, 1907.—All of the garden seeds have done well, but I was late in preparing some of the ground for the seed; so, of course, our cabbage has not had time to head well, nor the tomatoes time to mature, but I am satisfied that they will grow here if they are transplanted early enough. I mean to give them a good chance next year. I have a good spot for a garden; it is sheltered from all winds and the sun has a clear sweep at it all day long. I wish you could see our rhubarb; it is fine. All of the plants have done well except the tomatoes and cabbage plants, but this was our fault and not the fault of the tomato or cabbage seed, or of the climate. We have a nice little orchard from the trees which you sent to us; every tree is growing nicely, except the plum tree, and one of the willows died. We shall be glad to receive any further plants for experiment from you next spring and shall greatly appreciate anything you may have for free distribution.

A. Lawson, Sunrisc, November 1, 1907.—I thank you very much for the seeds you sent me. My gardening operations have been on a rather limited scale this season, owing to a very poor market and unfavorable weather. Potatoes grew poorly and are very watery on account of incessant rains and lack of sunshine. I did not raise any cabbage or cauliflower this season because my ground is infested with cutworms to such an extent that last year's crop was almost a failure. Beets, turnips, onions, and ruta-bagas turned out fairly well. Lettuce, radish, rhubarb, parsley, spinach, Swiss chard, pepper grass, mustard, etc., have always been a success with me regardless of weather conditions. I sowed some wheat May 18. It grew very nicely, headed out and bloomed, but could not progress further, it seemed; so after the killing frost it was cut down for green fodder. I sowed oats on some spare ground June 23 and they grew luxuriantly, heading out when the frost came. It made a very heavy yield of green feed. Apple trees and berry bushes growing nicely.

Alex Fridolin, Afognak, Alaska, November 10, 1907.—With seeds you have sent me I had the usual success, with the exception of flowers and cabbage (Early Jersey Wakefield), seeds of which were old and failed to produce plants. Oats (common), barley (Minnesota No. 6), millet (Siberian), were sown on May 11. The barley grew fine and all seeds ripened: the oats also grew fine, but only 80 per cent of seeds matured. The straw of barley was a little green yet, as was the straw of oats at time of cutting, October 28. The millet came up, but grew only to a height of 1 inch during the season. A new sort (at least here) of ruta-baga has been grown here for the past two seasons. Seeds were imported from Sweden by Mr. H. V. Scheele. It is of a cylindrical form, yellowish flesh, and of a good winter keeping quality. The currant and raspberry bushes are growing satisfactorily, but have not shown any flowers yet. The apple trees sent by you formerly are growing very slowly, but the later ones, which were much bigger, are growing remarkably well. The plum (3 trees) started to grow satisfactorily; the cherry (2 trees) are growing rather poorly. The Darrt crab apple is growing, but the Beecher sweet, having hardly any roots at time of planting, has died, as I expected. The basket willows are happy over their new home.

Henry S. Tibbey, Coal Harbor, Ungia Island, June 28, 1907.—By last *Dora* arriving here on June 26, I again became your most willing debtor for a variety of nursery plants, viz, 3 crab apple, 1 Darrt apple, 3 Wealthy, 3 Early Strawberry, 1 Beecher sweet apple, 2 plums, 2 cherry, 4 red currant, 6 white currant, 6 raspberry, 1 horse-radish, and 3 unknown. Those coming to me last year, save one, an apple, all perished during last winter and from no lack of care upon my part. Heretofore it has been my custom to set them out in the open directly from the mail package, which I believe to be a mistake. With this last lot I have carefully potted each one in selected soil and will care for them indoors till next spring, when they will be set out. One of the red currants sent here two years ago is in bearing this year and stands over 3 feet in height; another promises to follow suit next year. A small clearing in an alder patch has proved to be the warmest and most sheltered spot for tender nursery plants, and from most selfish motives I shall do my best to rear to maturity in such locations the last lot you sent us. An increasing interest seems to be growing among the native element in caring for cattle, making butter for sale, for home use, and depending less on the store and more and more on the products of the family cows for supporting and rearing their children.

August 31, 1907, suggested by the reading of Bulletin No. 3, entitled "Hay-making at Kenai Experiment Station," it occurred that my own experience, covering a period of two decades and confined exclusively to the curing of

native grasses at this place, might prove also instructive to those pioneers who are brave enough to face the agricultural problem in Alaska. At first my efforts were limited to a quantity sufficient to supply a working horse the year round and afterwards to include a small herd of cattle, from three to seven in number. A scythe and stone, a hand rake, and pitchforks for two men constituted our working implements and force. By cutting the grass, mostly bluetop, immediately after the seed had fallen, a crop was also assured for the next year and succeeding years from off the same ground; an earlier cutting would result in a fine crop of weeds for the next year, but no grass. To dry the native hay on the field overmuch and store in the barn causes it to pulverize and become smoky, the animals meanwhile coughing while eating it. The boiled-down essence of my experience in hay curing has resulted in proceeding as follows: One man cuts, another following closely spreads with pitchfork until as much is laid as can be worked quickly and made ready to haul in on next afternoon. After spreading turn, and when reasonably dry rake it into windrows, then gather with a hand rake into cocks and finally stack. Now it is sufficiently cured to make the best hay, improved perhaps by occasionally sprinkling a few handfuls of half-cracked salt as it is being filled into the barn and trampled down, on the afternoon of the next day after cutting. Should rain, however, occur after stacking, before hauling, the whole curing process must be repeated. By following this plan we have never failed to secure a crop of hay and of the best keeping quality. The winds that we depend upon for successful hay making are those from the northwest, which invariably mean clear, dry, and sunny weather with us. Winds from the southwest are always accompanied with squally, showery weather. One must avoid cutting more at a time than can be taken care of. To leave grass exposed to the wet weather for even a few days robs it of its nutritious properties.

I. S. Williams, Montauk Point, Eagle, Alaska, October 15, 1907.—The seeds you sent me last year have been tried with fair success. The cabbage did not do well. I believe the soil was not suited for it. Lettuce, radishes, and carrots of any kind grow as well as in any country. Scarlet Horn is really the best carrot. Parsnips and beets did fairly well. Potatoes about eightfold. They, as well as everything else, seem to grow better as the ground gets worked well with manure. My flowers did not do very well, probably due to late planting. Ruta-bagas and turnips grow fine. I am well pleased with the results, but expect to do still better next season, as I am learning. I thank you very much for the seeds received for next year.

R. C. Mitchell, Chicken, Alaska.—I will submit a report of what I have done. My notes will be brief, as I am situated so as to handle and care for only what seeds seem best suited to my immediate use. The hardier vegetables and plants seem to do well. Ruta-baga, beets, turnips, potatoes will not mature, though one can have plenty for home use. Carrots, kale, cress, cabbage, rhubarb, all give promise of moderate success. I had only new ground, but have a good garden spot for next season. I have no plow and only one horse. I cut and saved 60 tons wild hay in good condition. I am devoting most of my energy to trying timothy. Will give you report on nursery plants. Received the following plants June 25: 2 Whitney, 1 Early Strawberry, 1 Plum seedling, 3 Wealthy, 2 Crab apple, 6 currant plants, 4 white currants, 6 red raspberries. All are doing very nice except 3 raspberries and 1 currant, which are dead. The best growth wood, 12-inch sprouts, on the Whitney tree. Received the following September 25, all dry and dead: 4 small plants Iowa Beauty, 2 large plants Iowa Beauty, 2 large plants Whitney, and 2 seedling plums. The Eagle post-office is much crowded and likely these latter plants were stored with other mail for the summer. This is a high basin, close to 15 by 20 miles

in area, with low lying hills surrounding, which permits of a good sunshine, even in the shortest winter days. The soil is deep and rich, of a sandy loam or of decayed vegetable matter—probably an old lake bed. In future I hope to be fixed so as to give a thorough test to grains and will give my best care to all nursery stock. Thanking you for past favors.

A. H. Monroe, Rampart, Alaska, June 21, 1907.—I received the trees that you sent me and immediately planted them out in as good soil as there is here. Here is a list of the trees: 1 Martha crab, 1 Dartt crab, 4 Siberian crab, 4 Orange crab, 6 Seedling plum, 3 crab apples, 3 white currants, 7 red raspberries, 2 horse-radish—30 plants in all. The plants were in two packages and seemed to be in very good condition. They were sprouted some, but I think that by good care they will make a good growth this year. Of course we do not know if they will be able to withstand the low temperature of this country or not. We can only try. The rhubarb that was planted on this same ground lived through the winter. I have two seedling apple trees which came up this spring and which seem to grow fast. I shall watch these trees with much interest. This country appears to be the natural home of the red raspberry, for in some places there are large areas covered with them, and last year everyone who would take time got all he wanted to put up for the winter. The red currant is also very plentiful in places. As the spring was ten days earlier this year than usual the gardens are also earlier, and as there has been no lack of rain everything has been growing fine. I have not been over to the experiment station. I do not know how things are over there, but from this side of the river it looks as though the men are making good progress in the way of clearing off the ground, also the grain shows up very nicely from here. I believe there are more gardens planted in this camp this year than in any previous year. This is caused by the need of the miner, who now knows by observation that vegetables will grow here. Very few seeds are wasted, for if the one receiving them can not plant them he finds some one else who can. Thanking you again for the seeds and the trees.

Henry Butke, Chena, Alaska, October 15, 1906.—I wish to report the result of the seed that was sent me. Brussels sprouts, cabbage kale, carrots, and rutabaga all did very well; in fact, I never saw any better out in the States. Parsley, onions, and celery did not do very well. I planted turnips, potatoes, and string beans, some seed that I had, and they were extra fine. In fact, the only stuff that did not do well were onions, parsley, and celery. I hope you will send the nursery stock as early as possible, so I can get them set to get an early start.

W. Weurich, Chena, Alaska, September 15, 1907.—My ground is high and sandy, and lies along Tanana River. Small plants when set out were watered by means of an inexpensive water wheel, described below, which raises the water from the Tanana River. Part of the ground, about 8 acres, was broken this year, part three and four years ago. None of the ground, except one small patch, was fertilized with any other fertilizer than fish (salmon), decomposed the year before. Only part of the soil was thus fertilized, and the difference between the fertilized and nonfertilized vegetables amounts to 400 or 500 per cent. The late cabbage fertilized made heads weighing from 5 to 10 pounds, while those which were not fertilized did not head at all. We used one-half a fish between two hills of cabbage; that is, one fish, or the amount of decomposed matter corresponding, served for four hills of plants. The fish were dog salmon, which ran in the river by the thousands and thousands, and are only used by those who wish to dry them for dog feed. On March 29 (temperature 29° F. below at night, 10° above in the daytime, cloudy, cold, and windy), celery was planted in boxes in house (not light enough); did not set out, too spindling.

Seeded cabbage (Early Winningstadt) in hotbed made as follows: Glass top, sides and ends of logs 2 feet high, well mossed. Under entire length of bottom runs a 6-inch pipe carrying smoke and heat from a stove sunk below the level of bottom of bed at one end. There are three or four ventilators running from below, where stove heat rises up into hotbed, which is glass covered; thus the sun shines in and heat comes up from below, making it very warm. On April 13 sowed Early Winningstadt cabbage; came up April 16; planted out June 10; some headed September 10; very hard, fine heads, 4 to 6 pounds; an excellent keeper. Salzer Lightning, planted April 12; up April 16; set out June 1; commenced to head August 1. This is a successful early cabbage, but three or four days behind Early Jersey Wakefield, planted at the same time and under same conditions. We planted a bed to 10,000, which caught fire from the stove at end and burned out. This was all late cabbage. April 25, planted a number of late cabbage, including Premium Late and Flat Dutch. It was heading September 15, but should have been 10 days earlier, as we intended, had bed not burned. Many heads will go 10 pounds and more. Was fertilized with fish. That part of the field which was not fertilized will not make any heads worth speaking of. We decided to plant out the fall crop of cabbage—that is, late varieties—as early as possible before June 5–10, just as early as our earliest cabbage. Any cabbage that we plant after June 10 will be an early variety, which will mature before frost. Seeded cauliflower April 13. Early Snowball set out June 7–10, some 14–15; first pulled July 17, 10 days earlier than cabbage. Most of crop gone by September 7, only a few stray heads to be found September 15. It all headed out, but heads would scarcely average 1 pound. As it brings only a few cents a pound on market more than cabbage and weighs one-fourth as much as cabbage per head, with exactly the same expense for culture, it does not pay to raise it; that is, when you can sell all the cabbage you can raise on the same ground. Seeded celery April 13, in hotbed as above; set out in hotbed June 8–12; no fire under beds now, as fire is out and weather warm. Owing to the fact that this bed had very little horse manure the celery did not grow as luxuriantly as it should, but when bleached was of excellent flavor. That grown in about 1 foot of manure mixed with the same amount of sandy soils stands nearly 3 feet high. Used celery seeded April 13 on September 10. White Plume variety excellent flavor and quality. Brussels sprouts do not do well enough to pay, though there are many small heads on stalks. People will not pay a price to warrant raising them for market. Cucumbers planted out in hotbed April 12 were up April 16, and set out 6 inches high in hotbed June 10, 2 feet apart. As these were not covered with glass during summer they did not do well, though when covered and watched they do well. Tomatoes, a few seeds planted April 12, in hotbed, treated as cucumbers did nothing; should have been covered with glass and cut back. Planted potatoes May 19, home-grown seed, Early Rose and 56 pounds of a white variety, also home-grown. Soil broken up with plow April 16; double harrowed; laid off into rows with single shovel and planted shallow, 1 foot apart. The soil is sandy, but was not fertilized at all. Potatoes yielding about 12 for 1. If the difference is as great for potatoes as cabbages, fish fertilizer will make potatoes go 50 pounds for 1. I do not think that they will go less than 30 to 40 for 1 if they are properly fertilized. Potatoes came up June 12, and many were the size of an egg by July 25. Tops froze lightly September 1; killed about September 7. This could have been prevented by a few fires for a night or two. Last year we prevented injury to potatoes until September 20. Planted carrots May 21 on best fertilized land on place with horse manure and fish for fertilizer two years ago; did well, mostly pulled September 10. Carrots are hard to raise in here except on best

of fertilized land. Parsnips raised with like culture and conditions were not a success. Will plant no more for market. Peas, American Wonder and home-grown seed of Alaska pea did well; Alaska pea two or three days earlier. On June 14, planted about 40 pounds potatoes, poor seed, ground poor, no fertilizer, but September 10 many potatoes would do to use. June 14 is too late for a crop to pay. All sorts of lettuce and greens, turnips, radishes, etc., grow according to the amount of fertilizer put on the ground, but are nearly always crisp and tender. Our goods are raised to pay, and of course we have tons of cabbage, turnips, ruta-bagas, potatoes, etc., but it will be little ground that we attempt to cultivate without fertilizing.

Market gardening is of course an assured success in the Tanana Valley, for there are a dozen or more men who not only eke out an ordinary living but make money at the business by employing labor of five or six men, or more, to the ranch. This country, like most of Alaska (interior), is dry at certain times of the year. This difficulty we have overcome by using an irrigation wheel, turned by the current in the Tanana River. It has four wooden buckets 5 feet long and 12 by 18 inches deep attached to long arms which raise the water about 10 feet above the bank. The water runs into troughs and off to the bank where it is carried by troughs all over the place. This gives us plenty of water at all times for setting out plants and irrigating afterwards when necessary. The wheel throws from 50,000 to 100,000 gallons per day, depending upon the current, which varies as the water rises or falls. Such a wheel would, I think, prove satisfactory on the low benches along the Copper River. This wheel cost about \$100, most of which was for labor, as there is only 150 feet of lumber, the arms being poles from the timber, also the axle and raft logs, which support it in the water. I could give a more complete description to any inquirers, but it is an old idea and probably many can construct a better wheel than ours. To outsiders who hear of the prices that we obtain for our goods I would say that it is all right to put in the back end of a small lot for family use, but as a business it takes a few thousand dollars and at least two years' time to do anything at all; meanwhile those who are in the business will have gone so far that competition will be felt most bitterly, to say the least. I think it easier to buy a farm than to make one up here. Fruit trees which you sent this summer are doing well.

Mrs. Emma Pease, Fairbanks, Alaska, July 9, 1907.—I have just received the currant bushes, also the trees, and all are doing nicely. My garden is in good condition and I will have green peas to eat in a few days. The vines are in splendid condition and stand 3 feet high and are well filled with peas. I have had turnips to eat and beet greens, also radishes. I had two beds of radishes. The asparagus did not grow, and I think it was frozen. It did not come up. I planted everything on May 4. We had two heavy frosts, May 9 and May 11, and a heavy snowstorm on May 12, but it did not harm anything. The apple trees are growing nicely, as well as is everything else in the garden.

S. F. Shepard, Mary Island, Ketchikan, November 30, 1907.—I am pleased to report a good garden this year. I planted nothing but lettuce and radishes before the middle of May. All seeds went into the ground about that time. Lettuce and radishes could be grown here by the ton without trouble. We began using both June 1. Ruta-bagas and turnips grew well; some of them weighed 8 and 9 pounds. Transplanted cabbage June 10. They grew large and small, but all made good solid heads, some few weighing 12 pounds each. Potatoes did not grow overly large, but were what might be called a fair size. Parsnips and carrots large. Began to use green peas and new potatoes the first of July. Beets averaged in size about 3 inches in diameter. I succeeded in raising

good cucumbers, 2½ to 3 inches in diameter and plenty of them. A good way to treat cucumber vines in this part of the country is to keep most of the blossoms picked off and after the vines make a growth of 3 or 4 feet nip the end. I gathered 100 pounds of rhubarb from 15 plants this year. The currant bushes received from your station this year made a good start, also the apple trees. The plum and cherry trees both failed to grow. Siberian crab and Florence set out last spring are growing well; they are about 4 feet high. Have a fine red-raspberry patch. Next season I expect to have more berries than I can use. All free-flowering annuals do well here, as do pansies and pinks of all kinds. The ground, or soil, is improved by working. All it seems to need is frequent turning. I expect to have a better garden next year, although I am satisfied with this season's results.

F. N. Kreuz, Fairbanks, November 4, 1907.—This in reply to your request that I report results of my efforts at gardening at Fairbanks. My place is 36 by 50 feet. The soil was only 6 inches deep, so I wheeled some soil from the road to a depth of 1½ feet, and had about 3 inches of wood ashes and 4 inches of old horse manure mixed with it and tamped so the soil was raised 1½ feet above the ground. I planted two boxes with Wakefield cabbage, kept them in the cabin, and transplanted May 15. They did not grow much for the first two weeks. A big "worm" was eating the leaves off the stem. I had to keep transplanting them again until finally I had the worms destroyed. It grew profusely in dark rich healthy colors at all times. On June 15 it commenced to head up. Planted them 18 inches by 3 feet apart in rows. On September 15, when cut, from 10 to 15 heads weighed 15 pounds apiece, all good solid food for cooking; the smallest weighed 7 pounds; 50 heads in all. It was the best I have seen anywhere around town. Ruta-baga, Purple-top American, planted in garden May 12, did not look well; leaves full of little holes; insects must have been the cause. Thinned them out June 12 and transplanted some afterwards, which grew nicely. I would like to ask, if not too late, for another collection of your seeds for next year's planting. All the seeds from your station seem to be better than those bought here.

H. Buzby, Fairbanks, December 9, 1907.—On June 23, 1907, I received from the Sitka Experiment Station 2 red currants, 2 white currants, and 6 red raspberry roots. On June 30 I received from the same station 2 Whitney, 2 Duchess, 1 Strawberry apple tree, and 1 seedling plum tree. They had been on the road about 30 days and had all made from 4 to 8 inches of growth while packed. I placed them in a good location in good ground. The growth on the currant and raspberries died down, but a second growth started the last part of July. The plum and apple trees kept on growing and went into the winter in good shape. Snow fell October 10 and 15 to the depth of 15 inches. The winter has been very fine up to this date and I think the trees will winter all right. Will report next summer. Our vegetable crop last season was fine. I sowed a small plat of Macaroni wheat and Silver King barley on May 10. The barley was fine and fit to cut for seed August 10. The wheat made a good growth and filled well and was in the hard dough when I cut it August 25. Last season was a little cool here, but no frost after the spring frosts were over until September 1. There were great quantities of farm produce raised in this part of the Tanana Valley. The only question now is to bring the soil to as high a state of cultivation as possible and plant the very best seed and plant early. I planted potatoes April 29. They had been started in the greenhouse and had sprouts well developed; those potatoes were the best we had. We planted at intervals until June 1. Of all the root crops the first plantings were the best in every instance. We planted all our peas the last part of April; the crop was excellent; some of the late varieties made a growth of 7½ feet

and were loaded with fine peas. We planted Alaska, Early Prolific, Gradus, Centennial, Horsford Market Garden, Champion of England, and some field peas, and had peas from July 15 to September 10. We sold cauliflower (Maule Prize Early) July 22, cabbage (Estampes) same date, carrots July 24, turnips June 26, beets June 25, all from plantings made outdoors. Our rhubarb (Victoria), from yearling roots, transplanted last spring was fine. We raised onions (Silver Skin) from the seed that made good marketable onions and ripened nicely. Have some in the cellar at this time; are perfectly firm. There will be several acres of potatoes planted in and near Fairbanks next season.

J. F. Karshner, Hot Springs, Alaska, November 15, 1907.—I drop you a partial report of crops. The wheat will be first on the list. The crop was fine and did well. I put it out on a strip of ground that was handy for an experiment, to see the difference on poor ground and on rich ground—a clay ridge and a ravine or low piece of ground very rich. The clay ridge was the best, as the grain ripened about August 20, was very regular, and stood up better and bore very fine heads, stood about 3 feet high. The richer ground did not ripen as early and a storm laid the grain partly down. It was at least 1 foot taller than that sown on poorer ground and was at least one week later in getting ripe and the heads were no larger than the former. Birds, a sort of sparrow, got to bothering the wheat quite early before it was ripe and continued to eat it till the wheat was cut. The first I have observed of the kind on wheat. I shot a few, but they came in large numbers. Potatoes were a good crop. Early Rose, Early Ohio, Late Rose, Garnet Chilli yielded about 350 bushels to the acre; White Elephant, Burbank, and Snowflake about 250 bushels. We had about 100 tons of potatoes this season. Cabbage was not a full crop. Peas and Golden wax beans did well. Cucumbers only partial crop. Other crops only partial on account of late planting and indifferent handling (Pl. II, fig. 2). Tomatoes did not ripen as the year before. I will put out 30 acres or more of potatoes next season and other crops according as we shall have the ground in shape and more teams. Putting crops in early seems to be what is needed to get good results, and getting ground in shape the fall before by pulling all stumps, hauling manures, etc., on the ground. Our chicken ranch is a great feature. The hot ground makes an ideal place for the business. Will you send me a pamphlet on putting up a silo and treating silage? Our silo was a failure for this year, so please send me some publication on that.

Joseph T. Branton, Tanana Crossing, Alaska, February 4, 1907.—I take pleasure in saying that the seed you have sent have always been highly appreciated. I had a garden, about 2 acres, in vegetables last year. I had lots of turnips that would weigh 8 pounds each; parsnips and carrots that were fine. My cabbage I did not weigh, but I had some nice heads. The peas were fine; rhubarb—I never saw any better. We have a very nice climate here. If I could get a market for my vegetables I should make money. I have been trying to get some cattle here. I am sure they would do well. I had five horses that wintered out all last winter and there are three here this winter that have not been fed any as yet. I have been in the Fortymile country freighting since November, 1906. We have miles of bluetop grass from 3 to 4 feet high. In summer we could cut tons of it. If the Government is going to bring in any cattle, or sheep, I think this would be a nice place to put them. In this valley I have been greatly handicapped by not having a plow, but I have a plow now and I can break up some land for tame hay. I forgot to speak of the oats I planted last year. Some of them got ripe and headed out fine. I am always glad to hear from the Agricultural Department. I will assure you I will keep a better account of my vegetables in the future.

C. A. Fowler, Kuskokwim River, Alaska, February 2, 1907.—I planted the seed sent here by the experiment station and can say that most of it turned out very successfully, in fact all but peas; they were planted on the first of June and came up in about five days and grew nicely for three weeks and then seemed to stop for nearly a month. They then took another very thrifty start and grew luxuriantly for the rest of the season, but did not produce anything at all. Potatoes, turnips, radishes, cabbage, kale, ruta-bagas, and lettuce did just as well as at any place I ever saw. All seeds were planted in a sandy loam or a sedimentary deposit of the river. I see by the report of last year that cattle are being tried as an experiment. Now I wish to state that if there is any place in Alaska that cattle will be successful it is in the Kuskokwim Valley. There is an abundance of feed here; the blue joint grass grows here equal to any place on the globe and the summers are quite dry. There has been no time in the last four years that hay could not have been cured outside and the winters are not as long as they are farther north. We do not have over 12 or 18 inches of snowfall on the level at any time; then there is a thaw that cuts it down to the ground, which would be of great benefit in raising cattle. There is scarcely any time during the winter that cattle or horses could not be out browsing or grazing; that is, if they have sheds to go into at will, the same as in the northern part of Canada.

Rev. Adolph Stecker, Superintendent Moravian Mission, Bethel, Alaska, November 12, 1907.—In a few days the first winter mail will leave Bethel, and as it is the first mail since we have harvested our vegetables, I will give you a report of the result of our gardening. I am sorry to say that we had a very poor harvest, and no doubt so it has been all over this part of Alaska. We planted everything in the usual time from May 20 to the middle of June, but with the exception of a few dry clear days in a month it has been stormy all summer, southern storms prevailing. On account of having so little dry, clear weather everything has been held back. Potatoes yielded not half as much as last year. Cabbage had only very small heads. The cabbage plants were more than half destroyed by "worms," although we have not seen many butterflies this year, and although we have put lime mixed with ashes around all the plants. Ruta-bagas, carrots, and turnips were small. Even the flowers which grew other years in such wonderful profusion have not been so full nor so many, although we had some in our flower beds. The garden on the island in front of our station was last summer a failure. In spring the water was very high, soaking the ground and later the constant rain would not let the ground dry out enough. Yet I worked it and planted it, and after I had planted it, the very same day we had such a high tide that the whole island, and of course also the garden, was 1 foot under water. Several times afterwards the water became so high that it filled the furrows, yet I believe it is splendid soil. The young trees I received and planted June 21. They have grown very nicely. When it began to freeze in the beginning of October they were all alive with the exception of two small ones. The larger ones have beautiful green healthy leaves. After the ground was well frozen I covered the land around them with grass and we hope to winter them well. A number of white people, who went up the river, asked for seed and I distributed those which had come last year, for which they were very glad. Thanking you for the seed and trees received, I hope to be able to give a more encouraging report next year.

Jos. Perron, S. J., Holy Cross Mission, Koscefsky P. O., October 15, 1907.—I have the honor to report that we could save only four of the apple trees you sent us last year, but these four and the trees sent us this spring are doing very nicely. The currant bushes are doing well, but not so the raspberries. We had an unprecedented summer, very cold and almost continual rain and

only about six days of sun. We had a splendid spring for planting, yet on account of the summer our potatoes did not show up in number and quality as in former years, yielding this season only 500 bushels, while the average yield in the past was about 900 bushels. Carrots were fine, never better in size and quality. We had four beds 50 feet long and 4 feet wide. Beets gave good satisfaction, especially those we transplanted. The Purple-top turnips were the best among those raised, and the early variety of cabbage did well, but the late variety headed up small. Ruta-bagas did not do well. There were four beds of parsnips and they were fine. Radishes, celery, and salsify did moderately well, but the lettuce surpassed that of any previous year and headed so large and full as to resemble cabbage. We planted oats as usual, but we cut it for forage, as it never matures. On August 15 we sowed wheat and rye, and it attained a growth of 3 inches before the frost came. We hope to be able to give you a good account of this experiment next year. We have 12 acres of plowed ground and, all told, about 50 acres under cultivation, which supplies us with good hay for the cattle. We have 3 horses and 13 head of cattle, all doing well and kept in good condition on hay made in the country. Last winter (1906) we butchered a young bull weighing 800 pounds and the meat was excellent. We have three others, which will be fattened and killed later on. The yield of milk this summer was not as great as in former years, owing to the number of mosquitoes, the cattle not wishing to go far from the place. A fact hardly credible, nevertheless true, is that one of our cows last year gave 9 gallons of milk daily for a week, then 7 gallons for three weeks, then 6 gallons every day for a long period of time. The milk is very good and rich and we have made a good amount of very excellent butter and cheese. We have added a shingle mill and planer to our sawmill and use only shingles made in the country to cover the new buildings. I beg you to send as soon as possible the seeds requested. I think it would be well to have some arrangement with the Post-Office Department whereby the seed for places in Alaska could be forwarded quickly.

W. H. Snyder, Council, Alaska, December 5, 1906.—I have had a garden here for the last four years that has been a success. Radishes, turnips, beets, and all early vegetables do well. Had one hill of potatoes that yielded 6 pounds of nice potatoes. I have blue grass growing; it does well. We have fine soil. I think wheat, oats, and barley can be grown for hay.

Judge C. W. Thornton, Nome, Alaska, November 19, 1907.—I hereby report to you my success and partial failures with plants, trees, and seeds received from your station: First, apple trees; these, with currant and raspberry bushes, arrived in July. They had evidently been on the way for some time and did not appear to be in the best of condition. However, they were carefully planted and given attention and appeared to be doing well up to the latter part of August, when we had several cold storms, which seemed to blight and wither them and from which they seemed never to recover. The final freeze up came about the first of October, and these trees and bushes seem now to be dead. With vegetables I have a very different story to tell, having had wonderful success with some, particularly radishes, lettuce, turnips, and spinach. In fact, I beg to venture the assertion that no better radishes and turnips can be grown any place in the world than right here in Nome. I raised three crops of radishes on one patch of ground and some of the first crop, left in until the close of the season, attained a growth of nearly 2 inches in diameter, and were still as crisp and tender as any radishes I ever ate. Immediately adjoining us Henry Kuehne guarded and tended one of his earliest and largest turnips and at the close of the season it measured over 22 inches in circumference and weighed a little over 4 pounds.

Frank E. Howard, United States Commissioner, Coldfoot, Alaska, September, 1907.—As it is probably too late to forward matter from this remote place to reach you in time for your annual report, I will only give a brief statement of the result of my operations for the summer of 1907, accompanied by a few pictures of some vegetables I raised. The pictures are not first class, but I think they are plain enough to give you a fair idea of what can be done in gardening this far north; at least they will give a clearer idea than word picturing. My whole garden was unusually successful during the season of 1907. The reason for such was a prolonged period of clear warm days and nights, I could say a period of continuous day with almost continuous sunshine during June and July, with no cloudy weather and frosty nights, which conditions gave all plants an early and vigorous start. During the period I sprinkled and irrigated quite often. I transplanted cucumbers to open garden (vines started in boxes in the house) the first week in June. The cucumber bed was raised several inches above the general surface of the ground, with board inclosure raised 6 inches higher than the bed on the south and 12 inches higher on the north, causing the slope to face to the south. The first two weeks in June, for night protection, when the sun disappears behind our high northern peaks for an hour or two, I covered the bed with windows just before I went to bed and removed them the first thing in the morning. The result was much better than I expected, with cucumbers 6 and 7 inches in length. The variety planted was the Early White Spine. Do you know any account of cucumbers being raised in open garden 60 miles north of the Arctic Circle before? [I do not.—Ed.] In the cucumber bed I transplanted a tomato plant, which throughout the season maintained a healthy growth, attaining 18 inches in height, and blossomed profusely, but the plant bore no tomatoes. When the blossoms had filled they seemed to disappear very quickly, so quick that I was led to believe that birds or some insect was the cause. The birds, a little brown sparrow, are great depredators of young plants, especially lettuce, radishes, turnips, and such. A bird will pull as many plants as it can possibly jam into its mouth, then fly away to its nest. The young sparrows later inherit the same desire for something green and tender, and as soon as they can fly they begin their thieving. The most potent remedy I could find was to keep a loaded shotgun leaning against the fence. We had a fine bed of rhubarb in a board inclosure. It is the first year's growth from seed. The plants were started from seed in boxes in the house, and transplanted about June 10. After transplanting I covered the box inclosure with gunny sacking at night, which I believe helped very materially in the rapid growth of the plants. The turnips grown are Orange Jelly or Robertson Golden Ball, Yellow Aberdeen, and Yellow or Amber Globe, the seeds coming from Portland, Oreg.; also White Milan turnip, a specimen weighing 9 pounds 11 ounces. White Milans, Purple-tops, and White Globes are always an assured crop with proper care. I raised three crops of Long White Vienna radishes in one bed, seed from Portland, Oreg. The three crops produced exceedingly healthy roots, long, tender, and delicious. The long white radishes surpassed the growth of all red radishes, although Wood Early Frame, Long Scarlet, and all turnip-shaped radishes did well. The white radishes were not attacked by "worms," like some of the red ones. Early Summer cabbage and Early Jersey Wakefield were grown. The Early Jersey Wakefield produced the best results generally, the largest weighing 8 pounds. The best Early Summer weighed nearly 8 pounds. I will try more varieties the coming season. Cauliflower and broccoli also grew fairly well. I planted four varieties of lettuce—Denver Market, Early Prize Head, Early Tennis Ball, and Simpson Early Curled. Each variety headed; the first two mentioned gave the best results, and our restaurant man said that he had never before seen finer heads,

so large, tender, and crisp. I raised a bed of corn salad and dug corn salad out of 6 inches of snow, green and fresh. I raised three crates of beets, Early Egyptian and Early Blood turnip. Both of good quality, averaged good size, some being quite large and but few were inclined to be woody. I also raised one crate of carrots, Early Scarlet Horn and Chantenays. As an experiment in potatoes I used butter cans with the bottoms cut out and set 12 cans in a box with half a potato in each, starting the vines in the house. June 10, when vines were 2 inches high, I transplanted them, lifting the cans from the ground. The vines blossomed and produced seed balls as large as marbles, and I had new potatoes nearly three weeks earlier than from my crop planted in open garden—a miracle in this country to have new potatoes that early in the season. My potato crop generally was a success, for this country at least. The best result was from seed potatoes home-grown, two years, of which I have heretofore made mention. The whole crop blossomed. I sold several crates of potatoes at 25 cents per pound and have enough left for table use all winter and seed in spring.

METEOROLOGICAL WORK.

Condensed reports from thirty-seven stations are submitted herewith. The writer regards this work of the utmost importance to the development of agriculture in Alaska. Aside from the agricultural experiment stations and from the military telegraph stations, the observers are all private individuals, who have kindly volunteered to cooperate with the Department in securing these data. These persons are conferring a benefit on Alaska, and their labors are much appreciated. The Chief of the Weather Bureau has kindly furnished the instruments, which consist of a rain gage and a maximum and a minimum thermometer for each station. These instruments are either forwarded to the cooperative observers from the Weather Bureau direct or a supply is sent to the special agent in charge, who then equips the observers and establishes new stations when expedient. The value of the record depends upon two things—(1) the care and accuracy with which they are recorded and (2) the continuity of the reports. A large majority of the observers who volunteer to keep records of the weather take a vital interest in the work, and furnish excellent, reliable reports month after month and year after year. The condensed data of these reports which are submitted herewith should be studied carefully by those who want information on the Alaska climate.

Condensed meteorological reports.

SITKA: Lat. 57° 3', Long. 135° 20'. R. W. De Armond, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| December..... | 45 | 9 | 32.00 | 6.56 | 4 | 9 | 18 | 16 |
| 1907. | | | | | | | | |
| January..... | 44 | 7 | 27.28 | 2.36 | 19 | 5 | 7 | 6 |
| February..... | 49 | 9 | 34.03 | 3.55 | 8 | 4 | 16 | 12 |
| March..... | 48 | 9 | 32.32 | 1.75 | 13 | 2 | 16 | 8 |
| April..... | 62 | 28 | 40.54 | 1.80 | 10 | 14 | 6 | 6 |
| May..... | 72 | 35 | 52.35 | 3.84 | 15 | 3 | 13 | 10 |
| June..... | 63 | 45 | 49.81 | 3.66 | 7 | 5 | 18 | 22 |
| July..... | 75 | 44 | 54.40 | 4.66 | 10 | 5 | 16 | 17 |
| August..... | 77 | 43 | 54.47 | 12.60 | 3 | 6 | 22 | 20 |
| September..... | 67 | 37 | 54.16 | 15.75 | 14 | 2 | 14 | 13 |
| October ^a | 62 | 27 | 46.95 | 11.77 | 7 | 7 | 24 | 28 |
| November..... | 60 | 30 | 41.08 | 12.13 | 2 | 2 | 26 | 26 |

KENAI: Lat. 60° 32', Long. 151° 19'. Jas. W. Gray, observer.

| | | | | | | | | |
|----------------|----|-----|-------|-------|----|---|----|----|
| 1906. | | | | | | | | |
| November..... | 46 | -16 | 22.59 | 0.39 | 15 | 3 | 12 | 6 |
| December..... | 36 | -26 | 10.51 | 1.16 | 15 | 2 | 14 | 6 |
| 1907. | | | | | | | | |
| January..... | 34 | -29 | 7.74 | .68 | 19 | 2 | 10 | 6 |
| February..... | 38 | -38 | 3.73 | .61 | 16 | 1 | 11 | 6 |
| March..... | 40 | -28 | 14.44 | .67 | 16 | 5 | 10 | 5 |
| April..... | 53 | 5 | 36.31 | .04 | 10 | 8 | 12 | 2 |
| May..... | 72 | 23 | 44.74 | 1.24 | 14 | 4 | 13 | 9 |
| June..... | 64 | 28 | 48.51 | 2.31 | 8 | 3 | 19 | 16 |
| July..... | 69 | 31 | 48.25 | 5.49 | 7 | 6 | 18 | 23 |
| August..... | 70 | 31 | 51.75 | 3.35 | 9 | 4 | 18 | 16 |
| September..... | 74 | 20 | 47.94 | 10.09 | 10 | 7 | 13 | 14 |
| October..... | 55 | -1 | 31.14 | 4.04 | 4 | 1 | 26 | 12 |
| November..... | 40 | -12 | 22.26 | 2.15 | 12 | 2 | 16 | 7 |

COPPER CENTER: Lat. 62°, Long. 145°. C. W. H. Heideman, observer.

| | | | | | | | | |
|----------------|----|-----|--------|-------|----|-------|----|-------|
| 1906. | | | | | | | | |
| October..... | 58 | 9 | 30.93 | 0.74 | 5 | 10 | 16 | 7 |
| November..... | 44 | -21 | 8.76 | .99 | 11 | 9 | 10 | 6 |
| December..... | 40 | -46 | -16.27 | .35 | 10 | 2 | 19 | 2 |
| 1907. | | | | | | | | |
| January..... | 39 | -50 | -14.03 | .60 | 26 | 2 | 3 | 2 |
| February..... | 40 | -48 | -10.08 | .60 | 21 | 7 | 4 | 4 |
| March..... | 33 | -38 | 5.05 | .40 | 19 | 1 | 11 | 3 |
| April..... | 52 | -26 | 25.78 | ----- | 14 | 6 | 10 | ----- |
| May..... | 70 | 20 | 43.66 | .36 | 16 | 3 | 12 | 3 |
| June..... | 80 | 30 | 49.09 | 1.14 | 15 | 2 | 13 | 6 |
| July..... | 75 | 31 | 50.51 | .97 | 13 | 1 | 17 | 7 |
| August..... | 65 | 25 | 47.93 | .71 | 14 | 1 | 16 | 6 |
| September..... | 60 | 13 | 39.79 | .25 | 16 | ----- | 14 | 2 |
| October..... | 52 | -18 | 26.96 | 1.35 | 9 | ----- | 22 | 6 |
| November..... | 49 | -26 | 4.00 | .80 | 8 | ----- | 22 | 2 |

^a No minimum record on October 13 and 14, 1907.

Condensed meteorological reports—Continued.

RAMPART: Lat. 65° 30', Long. 150° 15'. F. E. Rader, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------|--------------|-----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maxi-mum. | Mini-mum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| September..... | 67 | 17 | 42.89 | 0.59 | 9 | 12 | 9 | 4 |
| October..... | 54 | - 2 | 26.04 | .61 | 1 | 4 | 26 | 5 |
| November..... | 27 | -50 | - 4.73 | .95 | 8 | 5 | 17 | 5 |
| December..... | 20 | -48 | -22.93 | .33 | 17 | 2 | 12 | 5 |
| 1907. | | | | | | | | |
| January..... | 38 | -59 | - 6.64 | 1.17 | 6 | 5 | 20 | 8 |
| February..... | 17 | -57 | -23.46 | .44 | 15 | 2 | 11 | 4 |
| March..... | 38 | -42 | 3.58 | 1.17 | 9 | 3 | 19 | 6 |
| April..... | 63 | -13 | 28.01 | .02 | 20 | 7 | 3 | 1 |
| May..... | 79 | 19 | 46.77 | .44 | 4 | 16 | 11 | 3 |
| June..... | 83 | 34 | 57.21 | 1.64 | 9 | 13 | 8 | 9 |
| July..... | 85 | 35 | 58.16 | 2.29 | | 11 | 20 | 20 |
| August..... | 84 | 31 | 55.62 | 3.38 | 13 | 13 | 5 | 18 |
| September..... | 67 | 20 | 39.03 | 2.52 | 7 | 5 | 18 | 15 |
| October..... | 35 | -28 | 13.45 | .65 | 9 | 4 | 18 | 8 |
| November..... | 27 | -39 | - 4.25 | .55 | 9 | 8 | 13 | 7 |

FORTMAN SALMON HATCHERY, LORING: Lat. 55° 20', Long. 131° 40'. Fred Patching, observer.

| | | | | | | | | |
|----------------|----|-----|-------|-------|----|----|----|----|
| 1906. | | | | | | | | |
| November..... | 47 | 25 | 36.81 | 21.57 | 3 | 6 | 21 | 24 |
| December..... | 44 | 8 | 27.06 | 7.96 | 5 | 6 | 20 | 17 |
| 1907. | | | | | | | | |
| January..... | 34 | -14 | 12.96 | .53 | 23 | 1 | 7 | 10 |
| February..... | 41 | -10 | 26.17 | 13.03 | 4 | 1 | 23 | 20 |
| March..... | 43 | 0 | 29.45 | 4.98 | 9 | 9 | 13 | 20 |
| April..... | 63 | 24 | 38.63 | 7.76 | 8 | 10 | 12 | 21 |
| May..... | 74 | 28 | 50.33 | 4.30 | 10 | 13 | 8 | 13 |
| June..... | 82 | 36 | 53.86 | 5.23 | 6 | 12 | 12 | 18 |
| July..... | 85 | 44 | 59.36 | 3.73 | 10 | 10 | 11 | 15 |
| August..... | 77 | 39 | 56.14 | 9.75 | 2 | 16 | 13 | 23 |
| September..... | 72 | 30 | 53.16 | 10.14 | 6 | 12 | 12 | 20 |
| October..... | 63 | 30 | 46.25 | 20.09 | | 13 | 18 | 31 |
| November..... | 51 | 29 | 38.28 | 24.55 | 4 | 11 | 15 | 27 |

JUNEAU: Lat. 58° 20', Long. 134° 30'. I. J. Sharick, observer.

| | | | | | | | | |
|----------------|----|----|-------|-------|----|----|----|----|
| 1906. | | | | | | | | |
| November..... | 54 | 28 | 41.05 | 1.22 | 9 | | 21 | 18 |
| December..... | 55 | 2 | 30.56 | 5.50 | 18 | | 13 | 12 |
| 1907. | | | | | | | | |
| January..... | 43 | 1 | 21.11 | 4.40 | 24 | | 7 | 8 |
| February..... | 45 | 8 | 26.53 | 8.88 | 14 | | 14 | 17 |
| March..... | 49 | 6 | 28.99 | 2.92 | 7 | 21 | 3 | 13 |
| April..... | 63 | 22 | 41.96 | 3.01 | 23 | | 7 | 12 |
| May..... | 72 | 34 | 51.99 | 4.31 | 23 | | 8 | 13 |
| June..... | 74 | 38 | 54.72 | 2.55 | 18 | | 12 | 18 |
| July..... | 73 | 45 | 57.95 | 4.39 | 16 | 7 | 8 | 15 |
| August..... | 79 | 41 | 55.78 | 9.60 | 13 | 10 | 8 | 18 |
| September..... | 67 | 34 | 51.21 | 12.81 | 20 | | 10 | 16 |
| October..... | 59 | 24 | 42.75 | 10.57 | 11 | | 20 | 28 |
| November..... | 51 | 30 | 39.21 | 4.58 | 5 | | 25 | 25 |

Condensed meteorological reports—Continued.

SKAGWAY: Lat. 59° 5', Long. 135°. H. D. Clark, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| November..... | 46 | 20 | 32.21 | 6.47 | 8 | 9 | 13 | 9 |
| December..... | 39 | — 4 | 17.75 | .33 | 10 | 7 | 14 | 4 |
| 1907. | | | | | | | | |
| January..... | 40 | — 5 | 14.82 | .46 | 16 | 12 | 3 | 5 |
| February..... | 42 | — 3 | 17.56 | 4.85 | 8 | 7 | 13 | 8 |
| March..... | 42 | 2 | 24.09 | .47 | 11 | 14 | 6 | 3 |
| April..... | 62 | 21 | 40.21 | 1.08 | 9 | 13 | 8 | 5 |
| May..... | 77 | 30 | 52.22 | .92 | 11 | 15 | 5 | 5 |
| June..... | 73 | 41 | 55.81 | .39 | 3 | 26 | 1 | 4 |
| July..... | 85 | 45 | 59.46 | .91 | 7 | 11 | 13 | 6 |
| August..... | 76 | 43 | 57.54 | 1.97 | 6 | 13 | 12 | 10 |
| September..... | 67 | 30 | 50.56 | 2.49 | 7 | 15 | 8 | 5 |
| October..... | 56 | 20 | 41.12 | 4.87 | ----- | 19 | 11 | 19 |
| November..... | 53 | 24 | 35.24 | 4.23 | 6 | 6 | 18 | 10 |

KILLISNO: Lat. 57° 30', Long. 134° 30'. Joseph Zuboff, observer.

| | | | | | | | | |
|----------------|----|----|-------|------|-------|----|----|----|
| December..... | 43 | 6 | 26.64 | 2.50 | 8 | 3 | 20 | 11 |
| 1907. | | | | | | | | |
| January..... | 36 | 5 | 19.48 | 1.40 | 21 | 3 | 7 | 4 |
| February..... | 45 | 5 | 26.41 | 9.55 | 7 | 2 | 19 | 17 |
| March..... | 50 | 8 | 29.55 | 1.70 | 9 | 11 | 11 | 9 |
| April..... | 57 | 28 | 40.53 | 1.35 | 9 | 7 | 14 | 11 |
| May..... | 65 | 31 | 47.14 | 1.60 | 9 | 10 | 12 | 7 |
| June..... | 67 | 40 | 51.19 | 3.85 | 6 | 10 | 14 | 12 |
| July..... | 68 | 42 | 54.19 | 3.05 | 7 | 10 | 14 | 12 |
| August..... | 70 | 40 | 53.88 | 4.65 | 2 | 12 | 16 | 24 |
| September..... | 61 | 32 | 48.36 | 6.85 | 5 | 12 | 13 | 11 |
| October..... | 57 | 27 | 43.56 | 8.05 | ----- | 5 | 26 | 29 |

KATALA: Lat. 60° 11', Long. 144° 34'. R. W. Moss, observer.

| | | | | | | | | |
|----------------|----|----|-------|-------|----|----|----|----|
| April..... | 51 | 22 | 36.91 | 7.50 | 8 | 10 | 12 | 11 |
| May..... | 68 | 31 | 45.64 | 4.85 | 12 | 4 | 15 | 17 |
| June..... | 79 | 41 | 49.59 | 8.29 | 7 | 7 | 16 | 20 |
| July..... | 78 | 43 | 55.28 | 13.96 | 3 | 3 | 25 | 23 |
| August..... | 78 | 36 | 53.96 | 11.41 | 6 | 9 | 16 | 23 |
| September..... | 74 | 36 | 50.88 | 12.34 | 11 | 5 | 14 | 19 |
| October..... | 54 | 22 | 40.89 | 25.62 | 2 | 4 | 25 | 29 |
| November..... | 54 | 20 | 35.34 | 12.44 | 4 | 4 | 22 | 24 |

ORCA: Lat. 60° 35', Long. 145° 41'. W. J. Shepard, observer.

| | | | | | | | | |
|-----------------------------|-------|----|-------|-------|----|----|----|----|
| November..... | 46 | 21 | 34.65 | 17.08 | 14 | 1 | 15 | 14 |
| December..... | 47 | 12 | 26.38 | 9.16 | 19 | 2 | 10 | 8 |
| 1907. | | | | | | | | |
| January..... | 38 | 10 | 25.75 | 3.26 | 23 | 3 | 5 | 4 |
| February..... | 40 | 5 | 22.24 | 8.53 | 14 | 1 | 13 | 12 |
| March..... | 45 | 4 | 25.23 | 3.95 | 22 | 8 | 1 | 7 |
| October ^a | 47 | 18 | ----- | 21.82 | 2 | 6 | 23 | 27 |
| November ^b | ----- | 18 | ----- | 13.25 | 4 | 11 | 15 | 16 |

^a Four days only in October, 1907.^b No maximum record in November, 1907.

Condensed meteorological reports—Continued.

FORT LISCUM: Lat. 61° 27', Long. 146° 27'. Lieut. L. H. Hanson, surgeon, U. S. Army, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| October..... | 52 | 27 | 39.72 | 8.51 | 12 | 3 | 16 | 15 |
| November..... | 46 | 8 | 29.18 | 7.50 | 15 | — | 15 | 11 |
| December..... | 40 | 3 | 20.88 | 6.75 | 16 | 3 | 12 | 7 |
| 1907. | | | | | | | | |
| January..... | 44 | 2 | 20.83 | .90 | 9 | 2 | 20 | 2 |
| February..... | 36 | — 9 | 15.80 | 10.14 | 7 | 6 | 15 | 11 |
| March..... | 38 | 3 | 20.70 | 6.04 | 10 | 11 | 10 | 8 |
| April..... | 53 | 11 | 34.53 | .82 | 15 | 4 | 11 | 5 |
| May..... | 70 | 25 | 44.57 | 4.05 | 13 | 7 | 11 | 18 |
| June..... | 68 | 35 | 48.80 | 2.83 | 4 | 22 | 4 | 23 |
| July..... | 70 | 36 | 51.45 | 11.25 | — | 4 | 27 | 27 |
| August..... | 66 | 31 | 49.62 | 10.61 | 3 | 4 | 24 | 25 |
| September..... | 66 | 27 | 44.81 | 11.98 | 7 | 3 | 20 | 19 |
| October..... | 50 | 10 | 35.53 | 16.77 | 4 | 3 | 24 | 25 |
| November..... | 47 | 11 | 29.24 | 7.94 | 2 | 6 | 22 | 17 |

WOOD ISLAND: Lat. 57° 47', Long. 152° 20'. S. A. Coldwell, observer.

| | | | | | | | | |
|----------------|----|-----|-------|------|----|---|----|----|
| 1906. | | | | | | | | |
| November..... | 48 | 20 | 35.98 | 5.10 | 9 | — | 21 | 11 |
| December..... | 44 | 14 | 29.04 | 3.20 | 6 | — | 25 | 9 |
| 1907. | | | | | | | | |
| January..... | 45 | 22 | 35.70 | 1.00 | 16 | — | 15 | 3 |
| February..... | 42 | — 3 | 26.04 | 4.00 | 13 | — | 15 | 7 |
| March..... | 50 | 9 | 32.24 | .00 | 22 | — | 9 | — |
| April..... | 58 | 9 | 37.71 | 6.10 | 3 | — | 27 | 8 |
| May..... | 67 | 31 | 45.54 | 6.30 | 6 | — | 25 | 12 |
| June..... | 71 | 35 | 49.16 | 5.20 | 11 | — | 19 | 10 |
| July..... | 71 | 43 | 54.72 | 3.50 | 12 | — | 19 | 8 |
| August..... | 65 | 41 | 54.02 | 3.70 | 10 | — | 21 | 7 |
| September..... | 71 | 35 | 51.73 | 9.00 | 15 | — | 15 | 10 |
| October..... | 56 | 16 | 40.73 | 8.70 | 9 | — | 22 | 15 |
| November..... | 47 | 13 | 32.36 | 7.70 | 10 | — | 20 | 15 |

SUNRISE: Lat. 60° 54', Long. 149° 35'. A. Lawson, observer.

| | | | | | | | | |
|--------------------------|----|-----|-------|------|----|---|----|----|
| 1906. | | | | | | | | |
| November..... | 42 | 3 | 24.26 | 3.87 | 6 | 6 | 18 | 6 |
| December..... | 38 | —15 | 10.14 | 2.30 | 13 | 4 | 14 | 10 |
| 1907. | | | | | | | | |
| January..... | 36 | —13 | 10.03 | 2.05 | 14 | 9 | 8 | 6 |
| February..... | 40 | —24 | 10.17 | 1.93 | 10 | 7 | 11 | 11 |
| March ^a | 36 | 2 | 23.70 | .33 | 1 | — | 4 | 3 |
| April..... | 55 | 10 | 35.28 | 1.41 | 10 | 7 | 13 | 11 |
| May..... | 68 | 25 | 45.35 | 1.30 | 11 | 8 | 12 | 14 |
| June..... | 75 | 34 | 49.58 | .74 | 6 | 9 | 15 | 15 |
| July..... | 72 | 39 | 52.72 | 4.62 | 4 | 8 | 19 | 22 |
| August..... | 68 | 35 | 51.22 | 2.29 | 4 | 8 | 19 | 17 |
| September..... | 67 | 26 | 47.28 | 4.45 | 6 | 5 | 19 | 14 |
| October..... | 55 | 6 | 34.18 | 6.03 | 3 | 6 | 22 | 24 |
| November..... | 51 | — 3 | 24.51 | 7.32 | 9 | 1 | 20 | 18 |

^a Five days only in March, 1907.

Condensed meteorological reports—Continued.

TYONOK: Lat. 61° 10', Long. 151° 40'. E. Fay Woolsey, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------|--------------|--------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maxim. | Minim. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| November..... | 46 | 1 | 26.08 | 1.04 | 12 | 7 | 11 | 6 |
| December..... | 35 | 12 | 12.59 | 1.38 | 15 | 7 | 9 | 3 |
| 1907. | | | | | | | | |
| January..... | 35 | -17 | 9.49 | 1.96 | 21 | 3 | 7 | 3 |
| February..... | 37 | -25 | 10.71 | 1.08 | 17 | ----- | 11 | 6 |
| March..... | 44 | - 8 | 19.58 | 1.66 | 21 | ----- | 10 | 5 |
| April..... | 56 | 14 | 36.35 | 2.24 | 16 | ----- | 14 | 3 |
| June..... | 68 | 33 | 50.80 | 2.86 | 9 | 3 | 18 | 13 |
| July..... | 69 | 41 | 54.25 | 6.39 | 11 | 3 | 17 | 20 |
| August..... | 73 | 37 | 55.40 | 3.05 | 12 | 5 | 14 | 15 |
| September..... | 66 | 31 | 48.36 | 5.76 | 4 | 12 | 14 | 16 |
| October..... | 57 | 5 | 34.82 | 3.48 | 11 | 6 | 14 | 16 |

COAL HARBOR: Lat. 55° 24', Long. 160° 49'. Henry S. Tibbey, observer.

| | | | | | | | | |
|----------------|----|-----|-------|------|----|----|----|----|
| 1906. | | | | | | | | |
| November..... | 49 | 20 | 34.80 | 4.24 | 6 | 10 | 14 | 11 |
| December..... | 46 | 12 | 28.50 | 2.75 | 11 | 8 | 11 | 12 |
| 1907. | | | | | | | | |
| January..... | 44 | 23 | 35.27 | 6.00 | 7 | 9 | 15 | 13 |
| February..... | 41 | - 3 | 21.39 | 2.07 | 14 | 8 | 6 | 5 |
| March..... | 55 | 1 | 32.41 | 1.43 | 6 | 12 | 13 | 9 |
| April..... | 46 | 14 | 33.08 | 7.99 | 6 | 10 | 14 | 13 |
| May..... | 55 | 25 | 40.85 | 3.50 | 5 | 12 | 14 | 13 |
| June..... | 70 | 34 | 47.37 | 1.88 | 6 | 11 | 13 | 13 |
| July..... | 70 | 37 | 51.89 | 4.71 | 4 | 11 | 16 | 14 |
| August..... | 64 | 36 | 49.65 | 4.90 | 2 | 14 | 15 | 17 |
| September..... | 73 | 35 | 49.41 | 5.84 | 5 | 13 | 12 | 16 |
| October..... | 52 | 23 | 38.93 | 5.83 | 6 | 17 | 8 | 17 |

DUTCH HARBOR: Lat. 53° 54', Long. 166° 32'. F. Schroeder, observer.

| | | | | | | | | |
|----------------------------|----|-------|-------|------|-------|-------|----|-----|
| 1906. | | | | | | | | |
| October..... | 53 | 29 | 42.03 | 7.91 | ----- | 5 | 26 | 17* |
| November..... | 47 | 20 | 35.28 | 5.38 | ----- | 1 | 29 | 14 |
| December..... | 52 | 23 | 39.08 | 5.76 | ----- | ----- | 31 | 11 |
| 1907. | | | | | | | | |
| January..... | 47 | 25 | 37.67 | 8.76 | 1 | 1 | 29 | 12 |
| February..... | 45 | 13 | 26.24 | 2.49 | ----- | 1 | 27 | 4 |
| March..... | 57 | 20 | 37.20 | 2.93 | ----- | 4 | 27 | 4 |
| April..... | 47 | 16 | 33.15 | 2.97 | ----- | 1 | 29 | 5 |
| May..... | 48 | 26 | 39.45 | 5.39 | ----- | 6 | 25 | 9 |
| June..... | 67 | 34 | 46.60 | 1.27 | ----- | 8 | 22 | 3 |
| July..... | 66 | ----- | ----- | 2.11 | 1 | 4 | 26 | 7 |
| August ^a | 62 | ----- | ----- | 3.25 | 2 | 13 | 16 | 18 |
| October ^b | 51 | 28 | 39.80 | 7.79 | 1 | 5 | 25 | 22 |

WORTMANS: Lat. 61° 30', Long. 146°. Allen Coughnour, observer.

| | | | | | | | | |
|----------------------------|----|-----|-------|-------|----|-------|----|----|
| 1906. | | | | | | | | |
| June ^c | 92 | 30 | 56.51 | ----- | 6 | ----- | 8 | 3 |
| July..... | 97 | 31 | 57.66 | ----- | 7 | 3 | 21 | 8 |
| August..... | 92 | 28 | 55.64 | ----- | 15 | 1 | 15 | 7 |
| September..... | 87 | 20 | 52.91 | ----- | 17 | 3 | 10 | 3 |
| October ^d | 63 | 12 | 39.70 | ----- | 13 | 5 | 13 | 1 |
| November..... | 51 | - 5 | 23.45 | ----- | 17 | ----- | 13 | 10 |
| December..... | 37 | -17 | 6.22 | ----- | 19 | 7 | 5 | 7 |
| 1907. | | | | | | | | |
| January ^e | 34 | -11 | 13.77 | 2.10 | 16 | 2 | 13 | 7 |

^a Minimum thermometer broken; no record.^b Twenty days only in October, 1907.^c Fourteen days only in June, 1906.^d Thirty days only in October, 1906.^e Nine days only in January, 1907.

Condensed meteorological reports—Continued.

TEIKHEL: Lat. 61° 40', Long. 145°. Jas. H. Anderson, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| July..... | 80 | 28 | 52.15 | 2.70 | 3 | 1 | 27 | 14 |
| August..... | 76 | 27 | 50.98 | .72 | 10 | 6 | 21 | 7 |
| September..... | 66 | 17 | 42.11 | .62 | 8 | 1 | 16 | 7 |
| October..... | 52 | 11 | 32.22 | 2.90 | 8 | 1 | 22 | 11 |
| November..... | 40 | -13 | 12.39 | 3.52 | 12 | 2 | 16 | 16 |
| December..... | 38 | -31 | -6.59 | .36 | 16 | 4 | 11 | 5 |
| 1907. | | | | | | | | |
| January..... | 35 | -32 | -3.67 | .36 | 21 | 2 | 8 | 5 |
| February..... | 37 | -36 | -1.25 | 1.83 | 15 | 2 | 11 | 9 |
| March..... | 42 | -28 | 7.85 | .56 | 16 | 5 | 10 | 8 |
| April..... | 58 | -18 | 28.63 | 14 | 18 | 1 | 16 | 4 |
| May..... | 76 | 21 | 47.08 | .80 | 10 | 8 | 12 | 6 |
| June..... | 84 | 30 | 53.53 | .68 | 7 | 5 | 19 | 8 |
| July..... | 100 | 32 | 59.77 | 8.20 | 7 | 7 | 17 | 7 |
| August..... | 103 | 49 | 55.59 | 2.00 | 12 | 3 | 15 | 4 |
| September..... | 75 | 19 | 47.09 | 1.20 | 1 | 8 | 16 | 3 |
| October ^a | 60 | 18 | 38.44 | .66 | | | | |

TONSINA: Lat. 61° 50', Long. 145°. Otto Eckel, observer.

| | | | | | | | | |
|----------------|----|-----|-------|------|----|---|----|---|
| 1907. | | | | | | | | |
| July..... | 87 | 38 | 57.54 | 0.14 | 6 | 1 | 24 | 2 |
| August..... | 73 | 28 | 53.38 | .53 | 13 | 5 | 18 | 7 |
| September..... | 66 | 16 | 45.36 | .43 | 16 | 1 | 9 | 5 |
| October..... | 60 | -22 | 29.81 | 1.07 | 8 | 1 | 22 | 5 |
| November..... | 47 | -24 | 7.82 | .80 | 12 | 2 | 16 | 3 |

KENNICOTT: Lat. 61° 30', Long. 143°. J. E. Williams, observer. Altitude 6,000 feet.

| | | | | | | | |
|------------------------|----|-----|-------|----|---|----|----|
| 1906. | | | | | | | |
| March ^b | 63 | 12 | 30.19 | 17 | 2 | 12 | 8 |
| April | 64 | 12 | 37.03 | 13 | 6 | 11 | 6 |
| May | 71 | 27 | 44.32 | 16 | 4 | 7 | 5 |
| June | 74 | 34 | 50.38 | 10 | 6 | 14 | 13 |
| September ^d | 59 | 35 | 41.55 | 13 | 3 | 12 | 3 |
| October | 56 | 14 | 33.64 | 8 | 5 | 23 | 7 |
| November | 43 | -10 | 16.33 | 10 | 5 | 15 | 8 |

CHESTOCHINA: Lat. 62° 30', Long. 145°. William F. Moderhak, observer.

| | | | | | | | | |
|------------------------------|----|-----|--------|------|----|----|----|---|
| 1906. | | | | | | | | |
| July..... | 79 | 33 | 54.80 | 1.78 | 10 | 11 | 10 | 4 |
| August..... | 71 | 32 | 51.20 | 1.48 | 14 | 11 | 6 | 6 |
| September ^e | 68 | 22 | 44.20 | .38 | 17 | 2 | 7 | 2 |
| October ^f | 52 | 6 | 28.60 | .10 | 5 | 2 | 16 | 1 |
| November..... | 40 | -14 | 11.20 | .50 | 10 | 5 | 15 | 3 |
| December..... | 31 | -35 | -9.22 | 1.80 | 14 | 2 | 15 | 4 |
| 1907. | | | | | | | | |
| January ^g | 15 | -30 | -13.18 | | 10 | 5 | 1 | 0 |
| February..... | 41 | -55 | -9.73 | .20 | 11 | 9 | 8 | 1 |
| March..... | 36 | -39 | -4.30 | .80 | 11 | 8 | 12 | 4 |
| April..... | 70 | -16 | 31.64 | .10 | 23 | 5 | 2 | 1 |
| May..... | 83 | 21 | 50.21 | | 16 | 6 | 9 | |
| June..... | 88 | 29 | 54.56 | 1.50 | 14 | 9 | 7 | 2 |
| July..... | 93 | 30 | 57.69 | 2.82 | 7 | 7 | 17 | 7 |
| August..... | 87 | 28 | 54.04 | 2.21 | 12 | | 19 | 6 |
| September..... | 75 | 23 | 43.99 | 2.07 | 9 | 1 | 20 | 9 |
| October..... | 62 | -18 | 28.14 | 1.34 | 11 | 1 | 19 | 5 |

^a Nine days only in October, 1907.^b No rain gage.^c Twenty-seven days only in May, 1906.^d Twenty-eight days only in September, 1906.^e Twenty-six days only in September, 1906.^f Twenty-three days only in October, 1906.^g Sixteen days only in January, 1907.

Condensed meteorological reports—Continued.

KETCHEMSTOCK: Lat. 64° 15', Long. 142° 20'. Michael Doran, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|------------------------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| July..... | 83 | 30 | 53.64 | 3.25 | 5 | 8 | 18 | 12 |
| August..... | 76 | 25 | 48.64 | 2.51 | 13 | 5 | 13 | 17 |
| September..... | 62 | 4 | 37.56 | .51 | 13 | 9 | 8 | 7 |
| October..... | 50 | 0 | 25.96 | .52 | 8 | 3 | 20 | 6 |
| November..... | 22 | -37 | 3.12 | .29 | 11 | 5 | 14 | 5 |
| December..... | 13 | -54 | -23.33 | .20 | 15 | 2 | 14 | 3 |
| 1907. | | | | | | | | |
| January ^a | 33 | -54 | -15.98 | .12 | 12 | 4 | 15 | 2 |
| February ^b | 25 | -54 | -24.92 | .20 | 12 | 8 | 8 | 3 |
| March..... | 33 | -53 | -5.22 | .27 | 10 | 10 | 11 | 3 |
| April..... | 59 | -40 | 28.73 | ----- | 14 | 10 | 6 | ----- |
| May..... | 76 | 20 | 45.10 | 1.30 | 10 | 14 | 7 | 5 |
| June..... | 80 | 27 | 51.74 | 2.03 | 3 | 15 | 12 | 18 |
| July..... | | | | | | | | |
| August ^c | 75 | 23 | 51.59 | 2.14 | 10 | 8 | 13 | 9 |
| September ^d | | 12 | ----- | .49 | 11 | 1 | 18 | 4 |
| October ^d | | -24 | ----- | .72 | 11 | ----- | 20 | 4 |

CENTRAL: Lat. 64° 33', Long. 145°. E. C. Wheeler, observer.

| | | | | | | | | |
|------------------------------|--|-----|-------|------|----|----|----|----|
| 1906. | | | | | | | | |
| August ^d | | 30 | ----- | 1.85 | 13 | 16 | 2 | 14 |
| September ^d | | 9 | ----- | .52 | 13 | 13 | 4 | 6 |
| October ^d | | 4 | ----- | .75 | 6 | 10 | 15 | 7 |
| November ^d | | -42 | ----- | .40 | 8 | 15 | 7 | 1 |
| December ^d | | -46 | ----- | .35 | 18 | 5 | 8 | 3 |
| 1907. | | | | | | | | |
| January ^{d e} | | -56 | ----- | 1.04 | 10 | 5 | 10 | 7 |
| February ^d | | -49 | ----- | .42 | 11 | 8 | 9 | 3 |
| March ^d | | -49 | ----- | 2.57 | 7 | 5 | 19 | 8 |
| April ^d | | -30 | ----- | .93 | 20 | 4 | 6 | 2 |
| May ^d | | 21 | ----- | .57 | 6 | 13 | 12 | 7 |
| June ^d | | 31 | ----- | 2.21 | 5 | 17 | 8 | 13 |
| July ^d | | 30 | ----- | 1.40 | 10 | 13 | 8 | 14 |

NORTH FORK: Lat. 64° 30', Long. 142° 10'. William F. Peyton, observer.

| | | | | | | | | |
|-----------------------------|----|-----|--------|-------|----|----|----|-------|
| 1906. | | | | | | | | |
| July..... | 82 | 37 | 56.33 | 2.69 | 11 | 7 | 13 | 8 |
| August..... | 72 | 36 | 56.70 | 1.01 | 8 | 19 | 4 | 4 |
| September..... | 62 | 7 | 40.21 | .72 | 19 | 4 | 7 | 3 |
| October..... | 52 | 4 | 28.99 | .42 | 1 | 9 | 21 | 7 |
| November..... | 33 | -47 | -35 | .38 | 6 | 7 | 17 | 4 |
| December..... | 8 | -54 | -22.00 | .38 | 13 | 2 | 16 | 7 |
| 1907. | | | | | | | | |
| January ^f | 36 | -55 | ----- | .69 | 15 | 2 | 14 | 8 |
| February ^g | 19 | -55 | ----- | .23 | 20 | 1 | 7 | 4 |
| March..... | 28 | -52 | -6.50 | .27 | 8 | 12 | 11 | 3 |
| April..... | 62 | -44 | 24.21 | ----- | 21 | 4 | 5 | ----- |
| May..... | 78 | 22 | 45.04 | 1.07 | 9 | 6 | 16 | 8 |
| June..... | 78 | 30 | 52.15 | 1.92 | 8 | 11 | 11 | 17 |
| July..... | 84 | 29 | 54.41 | 1.57 | 10 | 12 | 9 | 10 |
| August..... | 74 | 26 | 50.15 | 3.19 | 8 | 14 | 9 | 16 |
| September..... | 60 | 13 | 38.00 | 2.00 | 8 | 14 | 8 | 13 |

^a On 3 days temperature went below scale on thermometer.^b On 5 days temperature went below scale on thermometer.^c Twenty-one days only in August, 1907.^d Maximum thermometer broken; no record.^e Twenty-five days only in January, 1907.^f On 8 days temperature went below scale on thermometer.^g On 12 days temperature went below scale on thermometer.

Condensed meteorological reports—Continued.

FORT EGBERT: Lat. 64° 49', Long. 141° 12'. John A. Gustafson, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|------------------------|--------------|-----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maxi-mum. | Mini-mum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| November | 38 | -50 | - 0.53 | 0.57 | 9 | 4 | 17 | 3 |
| December | 34 | -55 | -16.56 | .07 | 20 | 3 | 8 | 1 |
| 1907. | | | | | | | | |
| January | 36 | -52 | - 8.29 | 1.45 | 25 | 1 | 6 | 3 |
| February | 20 | -54 | -18.54 | .20 | 26 | | 2 | 2 |
| March | 37 | -42 | - .67 | .00 | 4 | 23 | 4 | |
| April | 64 | - 5 | 33.36 | .15 | 21 | 1 | 8 | 1 |
| May | 82 | 21 | 49.87 | .60 | 17 | 5 | 9 | 4 |
| June ^a | 80 | 34 | 57.26 | 1.89 | 14 | 7 | 9 | 12 |
| July ^b | | 31 | | 1.48 | 10 | 3 | 18 | 4 |
| August ^b | | 27 | | 1.98 | 11 | | 20 | 13 |
| September ^b | | 19 | | 1.45 | 9 | 1 | 20 | 8 |
| October ^b | | -15 | | 1.12 | 3 | | 28 | 5 |

FORT EGBERT: Lat. 64° 49', Long. 141° 12'. Lieut. Ferdinand Schmitter, surgeon, U. S. Army, observer.

| | | | | | | | | |
|-----------|----|-----|--------|------|----|---|---|---|
| 1906. | | | | | | | | |
| July | 78 | 39 | 57.96 | | | | | |
| August | 72 | 28 | 47.46 | | | | | |
| September | 74 | 5 | 45.78 | | | | | |
| October | 75 | 10 | 30.83 | | | | | |
| November | 40 | -48 | .76 | | | | | |
| December | 24 | -51 | -15.59 | 0.07 | 20 | 3 | 8 | 1 |
| 1907. | | | | | | | | |
| January | 36 | -52 | - 9.98 | 1.45 | 24 | 1 | 6 | 3 |
| February | 20 | -54 | -18.54 | .20 | 25 | 1 | 2 | 2 |

CIRCLE CITY: Lat. 65° 41', Long. 144°. George H. Mills, jr., observer.

| | | | | | | | | |
|------------------------|----|-----|--------|------|----|----|----|----|
| 1906. | | | | | | | | |
| December ^c | 20 | -49 | -21.86 | 0.75 | 14 | 10 | 6 | 8 |
| 1907. | | | | | | | | |
| January ^d | 36 | -50 | -12.39 | 1.02 | 17 | 4 | 9 | 4 |
| February | 20 | -51 | -25.74 | .57 | 17 | 4 | 7 | 3 |
| March | 35 | -45 | .74 | .28 | 18 | 7 | 6 | 2 |
| April | 64 | -32 | 23.91 | .15 | 23 | 1 | 6 | 7 |
| May | 75 | 19 | 44.99 | .29 | 20 | 1 | 9 | 6 |
| June ^e | 86 | 42 | 63.93 | .50 | 6 | | 2 | 1 |
| July ^f | 96 | 40 | 60.01 | 1.36 | 22 | | 7 | 15 |
| August ^g | 85 | 29 | 55.88 | 2.59 | 14 | 2 | 14 | 12 |
| September ^h | 68 | 19 | 40.99 | 1.68 | 7 | 5 | 15 | 8 |
| October ⁱ | 37 | 1 | 22.69 | .96 | | 2 | 11 | 5 |
| November ^j | 34 | -44 | - 9.68 | 5.50 | 8 | 11 | 7 | 3 |

ALLAKAKET: Lat. 66° 45', Long. 151° 10'. Clara M. Carter, observer.

| | | | | | | | | |
|-------------------|----|-----|--------|------|----|----|----|----|
| 1907. | | | | | | | | |
| July ^k | 75 | 39 | 56.62 | 1.38 | | 7 | 1 | 6 |
| August | 75 | 26 | 52.83 | 2.49 | 4 | 20 | 7 | 17 |
| September | 55 | 12 | 37.94 | 1.45 | 2 | 18 | 10 | 11 |
| October | 37 | -41 | 10.44 | .70 | 13 | 10 | 8 | 7 |
| November | 31 | -47 | -13.63 | .63 | 11 | 8 | 11 | 10 |

^a Twenty-six days only in June, 1907.^b Maximum thermometer broken.^c Thirty days only in December, 1906.^d Thirty days only in January, 1907.^e Eight days only in June, 1907.^f Twenty-nine days only in July, 1907.^g Thirty days only in August, 1907.^h Twenty-seven days only in September, 1907.ⁱ Thirteen days only in October, 1907.^j Twenty-six days only in November, 1907.^k Eight days only in July, 1907.

Condensed meteorological reports—Continued.

FAIRBANKS: Lat. 64° 50', Long. 148° 9'. Isabel M. Emberly, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|----------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| October..... | 58 | 2 | 31.16 | 0.30 | 11 | 7 | 13 | 8 |
| November..... | 37 | -50 | -.06 | .65 | 9 | 9 | 12 | 4 |
| December..... | 30 | -46 | -16.67 | 1.15 | 17 | 1 | 13 | 9 |
| 1907. | | | | | | | | |
| January..... | 34 | -58 | -4.03 | 3.30 | 13 | 2 | 16 | 15 |
| March..... | 35 | -48 | 5.25 | 2.42 | 15 | 11 | 5 | 11 |
| April..... | 64 | -31 | 30.19 | .30 | 22 | 3 | 5 | 1 |
| May..... | 80 | 30 | 49.72 | .35 | 14 | 8 | 9 | 4 |
| June..... | 79 | 37 | 57.11 | 1.47 | 15 | 13 | 2 | 12 |
| July..... | 82 | 38 | 59.65 | 1.51 | 13 | 15 | 3 | 14 |
| August..... | 84 | 36 | 55.39 | 1.81 | 9 | 21 | 1 | 11 |
| September..... | 63 | 20 | 42.58 | 3.58 | 12 | 10 | 8 | 16 |
| October..... | 42 | -16 | 18.95 | 2.46 | 8 | 8 | 15 | 12 |
| November..... | 38 | -41 | -1.92 | .35 | 11 | 6 | 12 | 4 |

FAIRBANKS: Lat. 64° 50', Long. 148° 9'. Edward E. Merrill, observer.

| | | | | | | | | |
|----------------------------|----|-----|-------|-------|----|-------|----|-------|
| 1907. | | | | | | | | |
| June ^a | 86 | 41 | 59.91 | ----- | 7 | 5 | 19 | ----- |
| August..... | 84 | 35 | 55.93 | ----- | 12 | ----- | 19 | ----- |
| September..... | 65 | 19 | 43.63 | ----- | 9 | 6 | 15 | ----- |
| October ^b | 45 | -13 | ----- | 1.73 | 5 | ----- | 26 | 10 |

FORT GIBBON: Lat. 65° 10', Long. 152°. Charles B. Murphy, observer.

| | | | | | | | | |
|------------------------------|-------|----|-------|------|----|----|----|----|
| 1906. | | | | | | | | |
| October ^c | 38 | 4 | 22.51 | 0.05 | 12 | 3 | 10 | 2 |
| 1907. | | | | | | | | |
| August..... | 90 | 33 | 56.37 | 2.31 | 5 | 13 | 13 | 11 |
| September ^d | ----- | 20 | ----- | 2.32 | 7 | 14 | 9 | 9 |

HOLY CROSS MISSION: Lat. 63° 28', Long. 160°. Brother Constantine, observer.

| | | | | | | | | |
|----------------|----|-----|--------|-------|----|----|----|-------|
| 1906. | | | | | | | | |
| September..... | 60 | 25 | 44.78 | 2.49 | 14 | 9 | 7 | 11 |
| October..... | 44 | 10 | 30.06 | .11 | 15 | 5 | 11 | 2 |
| November..... | 35 | -34 | 3.11 | .90 | 21 | 1 | 8 | 2 |
| December..... | 34 | -36 | 8.28 | 1.02 | 17 | 6 | 8 | 4 |
| 1907. | | | | | | | | |
| January..... | 36 | -19 | 9.69 | 2.00 | 13 | 8 | 10 | 10 |
| February..... | 34 | -40 | -10.49 | .55 | 17 | 4 | 7 | 4 |
| March..... | 37 | -24 | 10.62 | 4.49 | 12 | 1 | 18 | 13 |
| April..... | 51 | -14 | 25.64 | ----- | 15 | 1 | 14 | ----- |
| May..... | 76 | 20 | 42.62 | ----- | 10 | 10 | 11 | ----- |
| June..... | 74 | 36 | 52.35 | 2.95 | 10 | 9 | 11 | 13 |
| July..... | 68 | 35 | 53.67 | 3.71 | 5 | 14 | 12 | 24 |
| August..... | 72 | 33 | 51.74 | 5.39 | 2 | 7 | 22 | 21 |
| September..... | 61 | 27 | 43.50 | 3.56 | 10 | 6 | 14 | 8 |
| October..... | 43 | -10 | 21.69 | .38 | 20 | 3 | 8 | 3 |

ST. MICHAEL: Lat. 63° 28', Long. 161° 48'. Leon E. Harper, observer.

| | | | | | | | | |
|------------------------------|----|----|-------|-------|---|----|----|-------|
| 1907. | | | | | | | | |
| June..... | 61 | 35 | 48.09 | 0.02 | 5 | 13 | 12 | 2 |
| August ^a | 68 | 32 | 51.18 | ----- | 9 | 9 | 13 | ----- |
| September ^a | 52 | 33 | 41.05 | ----- | 8 | 7 | 15 | ----- |

^a No rain gage.^b Six days in October, 1907, only; maximum thermometer broken.^c Twenty-five days in October, 1906, only.^d Maximum thermometer broken.

Condensed meteorological reports—Continued.

NOME: Lat. 64° 30', Long. 165° 24'. A. A. Gibson, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|-----------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| July | | | | 2.38 | 16 | 6 | 9 | 8 |
| September | | | | 1.02 | 19 | | 11 | 8 |
| October | | | | .93 | 8 | | 23 | 5 |
| November | | | | .32 | 22 | | 8 | 2 |
| December | 29 | -15 | 6.50 | 1.91 | 16 | 4 | 11 | 6 |
| 1907. | | | | | | | | |
| January | 33 | -24 | 11.94 | 2.64 | 10 | 4 | 17 | 8 |
| February | 31 | -31 | -7.55 | 1.46 | 19 | 2 | 7 | 5 |
| March | 33 | -32 | 5.58 | 3.37 | 11 | 2 | 18 | 8 |
| April | 41 | -14 | 18.98 | .10 | 18 | 2 | 10 | 2 |
| May | 49 | 15 | 34.28 | 1.12 | 10 | 5 | 16 | 10 |
| June | 65 | 30 | 45.33 | 1.31 | 12 | 5 | 13 | 10 |
| July | 66 | 34 | 50.04 | 2.08 | 10 | 4 | 17 | 16 |
| August | 69 | 30 | 49.80 | 2.08 | 8 | 9 | 14 | 17 |
| September | 52 | 29 | 41.06 | 1.41 | 13 | 6 | 11 | 13 |
| October | 44 | 3 | 24.49 | .16 | 15 | 3 | 13 | 4 |
| November | 39 | -12 | 9.48 | .06 | 10 | 4 | 16 | 4 |

COUNCIL: Lat. 64° 53', Long. 163°. G. A. Adams, observer.

| | | | | | | | | |
|-----------------------|----|-----|--------|--|--|--|--|--|
| 1906. | | | | | | | | |
| October ^a | 53 | 1 | 31.46 | | | | | |
| November | 40 | -24 | 8.78 | | | | | |
| December ^b | 23 | -26 | -2.33 | | | | | |
| 1907. | | | | | | | | |
| January | 34 | -29 | 9.03 | | | | | |
| February | 26 | -43 | -10.41 | | | | | |
| March | 47 | -40 | 14.45 | | | | | |
| April ^c | 57 | -14 | 20.04 | | | | | |
| May ^d | 73 | 8 | 37.13 | | | | | |
| September | 63 | 20 | 40.39 | | | | | |
| October | 46 | -10 | 9.61 | | | | | |

BLACK POINT: Lat. 64° 51', Long. 165° 15'. F. F. Miller, observer.

| | | | | | | | | |
|-------------------|--|--|--|------|----|----|----|----|
| 1907. | | | | | | | | |
| June ^e | | | | 1.01 | 4 | | 4 | 4 |
| July | | | | 1.94 | 8 | 9 | 14 | 16 |
| August | | | | 2.85 | 7 | 16 | 8 | 18 |
| September | | | | 3.26 | 20 | 3 | 7 | 14 |

TAYLOR: Lat. 65° 42', Long. 164° 48'. A. E. Edgtret, observer.

| | | | | | | | | |
|-------------------|--|--|--|------|----|---|----|----|
| 1907. | | | | | | | | |
| July ^f | | | | 0.66 | 3 | 3 | 8 | 5 |
| August | | | | .96 | 11 | 7 | 13 | 13 |

SHELTON: Lat. 65° 13', Long. 164° 48'. Lars Gunderson, observer.

| | | | | | | | | |
|-------------------|--|--|--|------|----|---|----|----|
| 1907. | | | | | | | | |
| July ^g | | | | 0.71 | 9 | 3 | 8 | 7 |
| August | | | | 1.33 | 11 | 3 | 17 | 17 |
| September | | | | .47 | 11 | 3 | 16 | 8 |

^a Sixteen days only in October, 1906.^b Twenty-seven days only in December, 1906.^c Twenty-five days only in April, 1907.^d Thirty days only in May, 1907.^e Eight days only in June, 1907.^f Fourteen days only in July, 1907.^g Twenty days only in July, 1907.

Condensed meteorological reports—Continued.

WALES: Lat. 65° 35', Long. 168° 5'. A. N. Evans, observer.

| Month. | Temperature. | | | Total precipitation. | Weather conditions (number of days). | | | |
|-----------------------------|--------------|----------|-------------|----------------------|--------------------------------------|----------------|---------|---------------|
| | Maximum. | Minimum. | Daily mean. | | Clear. | Partly cloudy. | Cloudy. | Rain or snow. |
| 1906. | °F. | °F. | °F. | Inches. | | | | |
| September..... | 53 | 27 | 40.20 | 0.66 | 8 | ----- | 22 | 7 |
| October ^a | 46 | 16 | 32.39 | 1.23 | 3 | 3 | 23 | 2 |
| November ^b | 38 | — 8 | 16.01 | .14 | 11 | ----- | 18 | 4 |
| December ^c | 20 | —12 | 6.31 | ----- | 1 | 1 | 17 | ----- |
| 1907. | | | | | | | | |
| January ^d | 39 | —25 | 6.45 | .68 | 21 | ----- | 8 | 5 |
| February ^e | 8 | —38 | —10.55 | .64 | 21 | 7 | ----- | 2 |

DEERING: Lat. 66° 10', Long. 162° 20'. Capt. J. E. Fox, observer.

| | | | | | | | | |
|------------------------------|----|----|-------|-------|---|---|----|----|
| 1907. | | | | | | | | |
| August ^f | 82 | 24 | 51.01 | ----- | 9 | 4 | 18 | 3 |
| September ^f | 67 | 20 | 37.78 | ----- | 5 | 9 | 16 | 12 |

^a Twenty-nine days only in October, 1906.^b Twenty-nine days only in November, 1906.^c Nineteen days only in December, 1906.^d Twenty-nine days only in January, 1907.^e Twenty-six days only in February, 1907.^f No rain gage.

